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PART I.

ORIGINAL COMMUNICATIONS.

ART. I.—*On the Natural Constants of the Healthy Urine of Man*[a]. By the REV. SAMUEL HAUGHTON, F.R.S., Fellow of Trinity College, Dublin.

THE following investigation was suggested to me by a remark of Bernouilli, to the effect that the total quantity of work of which a healthy man was capable appeared to him to be constant, no matter in what description of labour he was employed. The facts, as he understood them, were against this view: and he was forced reluctantly to give up his opinion. Before I read the opinion of this great man, I had arrived, from reflection and observation, at a similar result; and I think good reasons may be assigned, in the present state of our chemical knowledge, for a reasonable belief in this opinion. It is generally believed that the daily food we consume undergoes a process of oxidation before it is finally removed as waste matter from the system. This may be, and doubtless is, far from the whole truth; but, as far as it goes, it is true, and its investigation to its legitimate consequences must lead to correct views of nutrition and labour. It occurred to me that the natural and proper measure of the value of a given diet was the amount

[a] See vol. xxvii. p. 374.

of work it would produce in a healthy animal, such as man. This was Bernouilli's idea, but he applied it simply to mechanical labour of which man was capable, and so fell into error, natural to the deficient knowledge of his time.

The following appears to be a juster view of the subject:—

1. A man in health consumes, per day, a certain amount of food and drink, and excretes per day an equal amount of waste matter, supposing him to be full grown, in good health, and not gaining or losing flesh:—

2. The excretions are effected in four ways: *per halitum*, *per cutem*, *per vesicam*, *per anum*, and are more highly oxidated than the food and drink consumed.

3. The difference of oxidation of the *ingesta* and *excreta*, converted into work, should account for, and be equal to, the total labour effected per diem.

4. The work done per day may be divided into—

a. The effort necessary to live, or the work spent on the performance of organic functions—*Opera vitalia.*

b. The work, converted into heat, requisite to keep up the animal temperature—*Opera calorifica.*

c. The mechanical work effected by bodily labour—*Opera mechanica.*

d. The unknown, and hitherto unmeasured, work done by the mind—*Opera mentalia.*

It is an opinion of physiologists, and appears to be well founded, that the animal heat is fully accounted for by the oxidation of food effected *per halitum.* There remain, therefore, three excretions to consider, and three kinds of work to account for by their means, viz.:—

Excreta.—1. Per cutem; 2. Per vesicam; 3. Per anum.

Opera.—1. Vitalia; 2. Mechanica; 3. Mentalia.

I shall not attempt, in this communication, to discuss the general question, but shall confine myself to those subjects on which I have experimented directly, viz., the excretions *per vesicam*, and the mechanical labour of body, and work of mind, of which man is capable.

My experiments on urine were all made on the urine of healthy men, and were directed chiefly to the determination of the daily quantities of nitrogen and phosphorus excreted. I was forced into this course of chemical experiments by finding, in various authorities consulted by me, the most various estimates of a quantitative character relative to these subjects. For the convenience of reference, I shall divide my paper into four parts:—

I. The daily discharge of urea in healthy urine of man.

II. The daily discharge of uric acid in healthy urine of man.

III. The daily discharge of phosphoric acid in healthy urine of man.

IV. Comparison of the foregoing with the daily work, bodily and mental, and with the daily food, of man.

PART I.—*The daily discharge of Urea in healthy Urine of Man.*

The earlier writers on this subject refer the quantity of urea either to the fluid ounce, or to 1000 parts: both of these modes of estimating urea have been properly discarded by later writers, who estimate the quantity of urea discharged per twenty-four hours, considering this to be the natural period of man's cycle of labour, food, and rest.

The English medical writer on Urine who appears to be held in most repute is the late Dr Golding Bird, whose work has passed through five editions. He does not appear to have ever made any experiments himself, but is content to quote[a] from Becquerel's work.

I.—*Daily Urea.*

Daily urea of man, ...	270 grains.
Daily urea of woman, ...	240 „

The following determinations of urea in 1000 parts have been given by other writers:—

II.—*Urea in* 1000 *Grains.*

Berzelius, ...	30·10 grains.		
Lehmann, ...	31·45 „		
Ditto, ...	32·91 „		
Ditto, ...	32·90 „		
Becquerel (man), ...	13·84 „	1019	sp.gr.
Ditto (woman), ...	10·36 „	1015	„
Simon, ...	12·46 „	1011	„
Ditto, ...	14·58 „	1012	„

The discrepancies in the foregoing results show that it is absolutely necessary to fix upon some standard of comparison, such as the total quantity per twenty-four hours; otherwise our results will be vitiated by the drinking of a glass or two more or less of water per day, and by other trivial causes. Lehmann's three results are stated to be derived from twenty-four hours'

[a] Fifth Edition, page 75.

urine of a well-fed and healthy young man, but the total quantity passed is not stated.

Elsewhere M. Lehmann obtained the following interesting results from experiments made on himself:—

III.—*Urea per* 24 *Hours of M. Lehmann.*

Animal Diet.	Mixed Diet.	Vegetable Diet.	Non-Nitrogenous Diet.
821 grs.	501½ grs.	347 grs.	238 grs.

The following results, given by M. Lecanu, are also referred to a period of twenty-four hours:—

IV.—*Urea per* 24 *Hours, determined by M. Lecanu.*

Adult men, ...	431·9 grs.
Adult women, ...	294·2 „
Very old men (84–86), ...	124·8 „
Children (under 8), ...	138·2 „

Bischoff also has determined the daily quantity of urea passed by a well-fed man, of thirty-one years of age.

V.—*Urea per* 24 *Hours, at* 31 *Years of Age, by M. Bischoff.*

Urea, ...	585 grs.

On the preceding Tables the following remarks may be made:—

No. I. is to be rejected altogether, as it is totally erroneous by defect, and the deficiency must have arisen from the use of some imperfect method of determining the urea, such as by the nitrate or oxalate.

No. II. is unintelligible without a statement of the total quantity of urine passed per day in each case.

No. III. I believe to be excellent, as far as it goes, but it rests upon experiments made upon a single individual.

No. IV. omits to state the diet of the individuals experimented upon, and is, therefore, less interesting than it would otherwise have been.

No. V. agrees admirably with my own results.

The foregoing summary contains, I believe, all that was known on this subject at the time I commenced my experiments, which I should never have undertaken had I found it possible to obtain reliable information in the books.

I made some preliminary trials as to the various methods in use among chemists for the determination of urea quantitatively, and found Liebig's volumetric process, by means of nitrate of mercury, to give the most accurate and consistent results.

Having decided on the mode of analysis to be employed, I divided my subjects for experiment into two classes:—

1. Well-fed, flesh-eating, wine-drinking men.
2. Well-fed, water-drinking vegetarians.

The following Tables contain the result of my experiments:—

Table A.—*Beef-eaters.*

No.	Urea, per Day.	Urine, per Day.	Specific Gravity.	Urea, per fluid ℥.	Solids, per Day.
	Grains.	Ounces.		Grains.	Grains.
1	465·09	34	1023·8	13·70	817·25
2	677·25	62	1019·0	10·11	1065·69
3	644·62	52	1018·5	12·40	998·55
4	554·00	50	1015·8	11·08	818·00
5	630·00	45	1028·2	14·00	1330·20
6	484·30	41	1024·8	11·81	1051·25
Mean,	**575.87**	**47.3**	**1021.7**	**12.18**	**1013.49**

No. 1. Age, 37; weight, 126 lbs.; occupation, walks 5 miles per day, studies 5 hours per day; food, 8 oz. fresh meat; 8 oz. white bread; 10 oz. vegetables.

No. 2. Age, 35; weight, 126 lbs.; occupation, partridge-shooting, office-work 3 hours, anxious about business matters; food, mixed diet.

No. 3. Age, 19; weight, 126 lbs.; occupation, studies 5 hours; walking and athletic games, 2 hours; won the prize for the long jump at the Trinity College Foot Races; food, mixed.

No. 4. Age, 39; weight, 174 lbs.; occupation, walks 2 miles, office-work, 6 hours; food, mixed.

No. 5. Age, 40; weight, 189 lbs.; occupation, walks 4 miles, studies 4 hours; food, mixed.

No. 6. Age, 40; weight, 145 lbs.; occupation, walks 5 miles, studies 2 hours; food, mixed.

From the preceding results it follows that 576 grains of urea per day is the natural discharge, *per vesicam*, of the class

of men experimented upon. This agrees with Bischoff's and Lehmann's experiments made upon themselves.

I shall make no observation at present on the range from 100 grains below to 100 grains above the average, as I do not believe it to depend on any single circumstance, such as weight, bodily exercise, &c., but upon a combination of circumstances which I hope fully to discuss in the concluding part of this paper.

I have also to add that every one of these specimens of urine gave, on the addition of nitric acid, at 50° Fahr., after standing twenty-four hours, a precipitate of crystals of nitrate of urea. This circumstance I do not believe to be a proper test of excess of urea in urine.

The following Table contains the corresponding results of my experiments on vegetarians:—

Table B.—*Vegetarians.*

No.	Urea, per Day.	Urine, per Day.	Specific Gravity.	Urea, per fluid ℥.	Solids, per Day.
	Grains.	Ounces.		Grains.	Grains.
1	367·50	70	1014·00	5·25	1012·90
2	578·81	81	1014·76	7·14	1236·87
3	315·00	45	1015·23	7·00	712·50
4	366·12	56	1012·41	6·54	717·08
5	342·55	43	1017·17	7·87	775·60
Mean,	**393.99**	**59**	**1014.71**	**6.76**	**890.99**

No. 1. Age, 63; weight, 173 lbs.; occupation, walks 3 miles per day, office-work 1 hour; food, 1 egg, 6 oz. bread, vegetables *ad lib.*, 16 fl. ℥ milk, 40 fl ℥. water.

No. 2. William Wall, 16th Regt. (2nd Battalion), in Military Prison, Dublin. Age, 22; weight, 132 lbs.; occupation, 3 hours' shot drill, 1¼ hour ordinary drill, 3½ hours oakum picking; food, breakfast, 8 oz. oatmeal, ½ pint of milk,—dinner, 9 oz. Indian meal, ½ pint of milk,—supper, 8 oz. of bread, ½ pint of milk.

No. 3. William Tysack, Military Train, in Military Prison, Dublin. Age, 31; weight, 146 lbs.; occupation and food, same as last.

No. 4. Thomas M'Donald, 18th Regt. (2nd Battalion), in

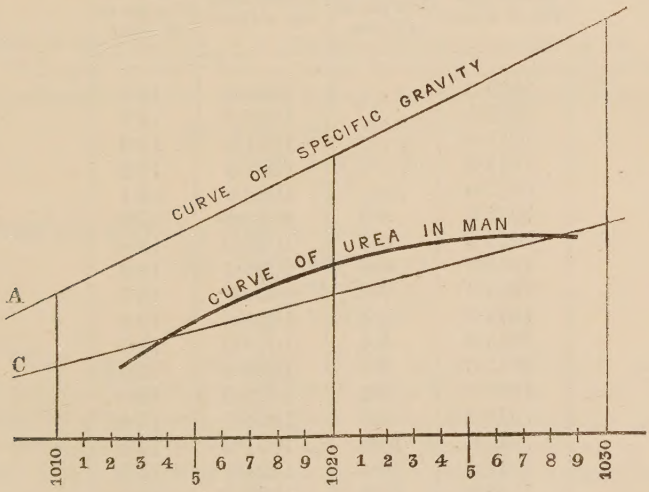
Military Prison, Dublin; age, 22; weight, 146 lbs.; occupation and food, same as last.

No. 5. Same man as No. 3, a fortnight subsequent.

From the preceding, it follows that 394 grains is the natural discharge of urea from a well-fed vegetarian per day. No. 2 appears to be exceptional, and above the usual average; but, even allowing for this, it would appear that the average for vegetarians is considerably above what is considered usually by medical men in this country as the proper average of well-fed men, on the authority of Golding Bird. It is quite certain that a physician, applying Bird's rule in his private practice, would, probably, pronounce 90 well-fed men, out of every 100 who consulted him, to be labouring under diabetes insipidus: although, from the foregoing experiments, they should be entitled to be considered as in the enjoyment of excellent health.

I shall now attempt to connect the quantity of urea in healthy urine with the specific gravity.

The result of all my experiments is shown in the annexed diagram, in which the base line represents the specific gravity, and the vertical ordinates, the number of grains per fl. ℥, either of solids or urea.



The right line A, marked *Curve of specific gravity*, is drawn by making the ordinate equal the abscissa, minus 1000; thus, 1015 sp. gr. has an ordinate of 15 units measured off; 1020 sp. gr. has an ordinate of 20, and so on.

The line C is formed by dividing the ordinates of the line A in half; and the *curve of urea in man* is formed by taking for each specific gravity observed, an ordinate equal to the number of grains of urea per fl. ℥ corresponding.

This curve of urea intersects the line dividing the ordinates of the curve of specific gravity in half, at points corresponding to the specific gravities 1014 and 1028. If, therefore, the specific gravity of healthy urine be 1014 or 1028, the number of grains of urea per fl. ℥ will be 7 or 14 respectively. For all specific gravities intermediate between these limits, the number of grains of urea per fl. ℥ will be *greater* than half the excess of the specific gravity above 1000; and for specific gravities *below* 1014 and *above* 1028, the number of grains of urea per fl. ℥ will be *less* than half the excess of specific gravity above 1000.

The following Table contains the summary of all my experiments on this subject:—

Table *derived from Experiment, showing the relation between the Specific Gravity of Healthy Urine, and the Quantity of Urea contained in it.*

Specific Gravity of Urine.	Grains of Urea per oz. of Urine.	Specific Gravity of Urine.	Grains of Urea per oz. of Urine.
1010·0	. . .	1020·0	12·2
1010·5	. . .	1020·5	12·4
1011·0	. . .	1021·0	12·6
1011·5	. . .	1021·5	12·9
1012·0	. . .	1022·0	13·1
1012·5	5·0	1022·5	13·3
1013·0	5·7	1023·0	13·4
1013·5	6·6	1023·5	13·5
1014·0	7·2	1024·0	13·7
1014·5	7·8	1024·5	13·8
1015·0	8·4	1025·0	13·9
1015·5	8·8	1025·5	13·95
1016·0	9·2	1026·0	14·0
1016·5	9·6	1026·5	14·0
1017·0	10·0	1027·0	14·0
1017·5	10·4	1027·5	14·0
1018·0	10·9	1028·0	14·0
1018·5	11·2	1028·5	13·95
1019·0	11·5	1029·0	13·9
1019·5	11·9	1029·5	. . .

It is evident from the diagram, p. 7, that the curve which represents the relation of the quantity of urea in healthy urine to the specific gravity of the latter is not a right line; or, in other words, that the quantity of urea is not *proportional* to the specific gravity.

The curve laid down in the diagram is a representation of the Table, and may be algebraically expressed by a parabolic curve, as follows:—

Let y denote the grains of urea per fl. ℥ in any specimen of urine, not containing either sugar or albumen; and let x denote the excess of specific gravity above 1000. Then,—

$$y = A + Bx + Cx^2. \qquad (1)$$

And, since when $x = 14$, $y = 7$; and when $x = 28$, $y = 14$; and the curve then reaches its highest point, it is easy to show that,—

$$\begin{aligned} A &= -14 \\ B &= 2 \\ C &= -\tfrac{1}{28} \end{aligned} \qquad (2)$$

From these values it can be shown that the curve of urea (1) may be put into the form,—

$$[28 - x]^2 = 28\,[14 - y], \qquad (3)$$

which is the equation of a parabola whose parameter is 28.

It is easy to verify this equation by the Table already given. For example, let the specific gravity be 1018, then we have,—

$$\begin{aligned} (28-18)^2 &= 28\,(14-y) \\ 100 &= 28\,(14-y) \\ y &= 10{\cdot}5 \text{ grs.} \end{aligned}$$

Let specific gravity = 1024, then,—

$$\begin{aligned} (28-24)^2 &= 28\,(14-y) \\ 16 &= 28\,(14-y) \\ y &= 13{\cdot}43 \text{ grs.} \end{aligned}$$

These results, and others similar to them, obtained from the parabolic curve (3), differ slightly from those found directly by experiment, and given in the Table, showing that the parabolic curve does not accurately represent the curve of urea; but it evidently does so within a degree of approximation much less than is required by medical men, for whose purposes the following bedside rule may prove quite sufficient:—"*Half the excess of the specific gravity of urine* (*not containing either sugar or albumen*), *above* 1000, *is the number of grains of urea per fluid* ℥."

This rule gives the line C, p. 7, for the curve of urea, with which it agrees at the specific gravities of 1014 and 1028.

The following determination of urea in sheep's urine may prove interesting, for comparison with the urine of man; the range of specific gravity is greater, and the proportion of urea to specific gravity is also greater:—

	Specific Gravity.	Urea, Grains, per fluid ʒ.
Urine of ram, ...	1057·06	37·33
Urine of ewe, ...	1008·93	6·41

Before concluding this part of my paper relating to urea, I may add the following interesting facts, although they do not properly belong to the subject of healthy urine. I examined carefully for urea, having first got rid of albumen, the serous effusion of the pericardium of two subjects, both women, one of whom had died of Bright's disease, with dropsy; and the other had perfectly healthy kidneys. The result of the examination was as follows:—

	Grains, per fluid ʒ.
1. Subject with diseased kidneys, . . .	3·05
2. Subject with healthy kidneys, . . .	1·31

The difference in the two cases is sufficiently striking, and the total quantity of urea in the dropsical effusion of No. 1 must have been very great; yet the quantity in the case No. 2 is also so large as to make us hesitate as to the conclusions to be drawn from the qualitative determination of the presence of urea found, on a post-mortem examination, in the pericardium, or in the ventricles of the brain.

Part II.—*The daily discharge of Uric Acid in healthy Urine of Man.*

The following Tables contain the results I obtained from my experiments, with respect to Uric and Hippuric acids. They are so different from those usually received that they would require explanation, which I should offer, were it not that I believe that both uric and hippuric acids are accidental in healthy urine, though the former is always found in small quantity; the latter, hippuric acid, occurred to me only once, though it was carefully sought in each case. When I say that uric acid is accidental in healthy urine, I do not mean to say that it occurs like chlorine and sulphuric acid, the quantity of which depends directly on the chloride of sodium, and sulphate of alumina and potash consumed with the food; but I

do mean, that no uric acid whatever should occur in the urine of a man in perfect health, but that all the nitrogen of the urine should pass off in the form of urea, a more highly oxidated product than uric acid.

The following determinations of uric acid passed in twenty-four hours have been given:—

VI.—*Uric Acid discharged per Day.*

	Grains.
Becquerel,	8·10
Neubauer,	5·08
Ditto,	7·63
Lehmann,	18·17

It is stated by Liebig, that 7·5 grains of hippuric acid are discharged by the urine per day; this is quite at variance with my results, as will appear from the following Tables:—

Table C.—*Uric Acid per Day (Beef-eaters).*

No.	Grains per Day.
1,	1·02
2,	11·88
3,	1·04
4,	7·40
5,	5·29
6.	0·71
Mean,	**4.55**

Table D.—*Uric Acid per Day (Vegeturians).*

No.	Grains per Day.	
1,	0·50	
2,	0·71	
3,	1·69	partly hippuric acid.
4,	2·48	
5,	2·03	partly hippuric acid.
Mean,	**1.48**	

When we consider that the quantity of urea passed by the persons considered in these Tables, per day, is 576 grains, and 394 grains, respectively, we may fairly consider the uric acid discharged simply in the light of a minute fraction of nitrogen, which has escaped complete oxidation, and as a matter rather of chemical than physiological interest.

The only case in which I detected hippuric acid was that of William Tysack (Nos. 3 and 5, Tables B and D). His urine

had a remarkable smell, compounded of that of sweet hay and apple-juice, and differed in its sensible qualities from the other urines examined.

All the preceding experiments were made on not less than from 20 to 50 ounces of urine, and I am certain that all the uric acid was obtained.

Part III.— *The daily discharge of Phosphoric Acid in healthy Urine of Man.*

There is no subject respecting which more difference of opinion exists than with reference to Phosphoric acid eliminated by the kidneys; some investigators considering that it is as accidental in its character, and as dependent on food, as chlorine or sulphuric acid; while others regard it as the direct product of the disintegration of nervous tissue, and, as such, entitled to our regard as the measure of nervous work done by the system. In whatever point of view it is to be considered, it is obviously important to determine its daily amount in the case of healthy men, under different conditions as to food and work of mind and body. I therefore determined its absolute amount per day with much care; and, in my later experiments, ascertained also the proportions in which it occurred combined with alkalies, with those in which it was found in combination with lime and magnesia.

The following Tables are divided, as before, into the flesh-fed and vegetarian subjects:—

Table E.—*Discharge of Phosphoric Acid per Day* (*Beef-eaters*).

No.	Phosphoric Acid.	Weight.
	Grains.	lbs.
1	47·14	126
2	43·28	126
3	40·78	126
4	38·10	174
5	23·72	189
6	29·43	145
Mean,	**37.07**	

I have placed the weights of the several subjects in connexion with their respective discharges of phosphoric acid, and I think it will be admitted that there is no direct proportion

between them, such as would be the case, were the discharge of phosphoric acid dependent simply on a waste of albuminous or other tissues proportional to the mass of the individual considered.

Table F.—*Discharge of Phosphoric Acid per Day (Vegetarians).*

No.	Total Phosphoric Acid.	In combination with Earths.	In combination with Alkalies.
	Grains.	Grains.	Grains.
1	30·00		
2	32·47	5·92	26·55
3	22·78		
4	27·54	6·30	21·24
5	20·70	3·46	17·24
Mean,	**26.70**	**5.23**	**21.67**

I have reason to believe that the proportion of phosphoric acid, in combination with alkalies, to that in combination with earths, given above, viz., 4 to 1, is the same in well-fed men as in vegetarians, and that it may be confidently used in drawing conclusions with respect to this subject.

To show how ill founded the idea is, that the waste of nervous matter in the system gives rise exclusively to the discharge of phosphoric acid, the following calculations may prove of some interest. Adopting Vauquelin's determination of the phosphorus in the brain at 1·5 per cent, and taking the weight of the brain and spinal cord from the most recent experiments, at 51 ounces, we find, the following chain to determine the total phosphoric acid existing in these nervous centres at any given moment:—

Term of demand, 1 man.

1 — 51 $\frac{2}{3}$ nervous matter.
1000 — 15 $\frac{2}{3}$ phosphorus.
32 — 72 $\frac{2}{3}$ phosphoric acid.
16 — 7000 grs. phosphoric acid.

= 753·04 grs.

This quantity of phosphoric acid in the nervous system of a well-fed man, discharging 37 grains per day, *per vesicam*, would only last for twenty days; and although the brain is better supplied with blood than any other portion of the body, it is quite

incredible that the process of renovation can proceed at such a rate as to replace all its phosphorus in twenty days.

On the other hand, we may fairly conclude that only the phosphoric acid, in combination with lime and magnesia, can be considered as having its origin in the wear and tear of the bony tissue; and, assuming the average weight of bone-earth in a man of 150 lbs. to be 10 lbs., we find the following chain to determine the number of days in which his bones can be removed *per vesicam*, and replaced by suitable food:—

Term of demand, 1 man.
1 — 150 lbs.
150 — 10 lbs. bone earth.
156 — 72 lbs., PO_5.
1 — 7000 grs. PO_5.
5 — 1 day.
365 — 1 year.

= 17·70 years.

Whatever may be thought of the idea that our bones are replaced in the manner here supposed, the result obtained is certainly less improbable than the former. I give them both, without attaching weight to them, as examples of the uses to which the analyses of healthy urine may be turned.

The following summary contains the results of my experiments on the eleven specimens of urine of twenty-four hours, examined by me. I made several careful determinations of the relation between specific gravity and the total quantity of solid matter per fluid ℥, and I found my experiments agree so closely with the Table published in Dr. Golding Bird's work, and deduced from Dr. Christison's formula, that I adopted the results of this Table in all my subsequent experiments.

Table G.—*Well-fed Beef-eaters.*

No. 1.

	Grains per Day.
1. Urea,	465·09
2. Uric acid,	1·02
3. Fixed salts, earthy,	23·46
,, alkaline,	214·54
4. Difference,	113·14
Total,	817·25
A. Chlorine,	26·30
B. Phosphoric acid,	47·14

Table G—*continued.*

No. 2.

	Grains per Day.
1. Urea,	677·25
2. Uric acid,	11·88
3. Fixed salts, earthy,	22·68
,, alkaline,	221·94
4. Difference,	131·94
Total,	1065·69
A. Chlorine,	49·42
B. Phosphoric acid,	43·28

No. 3.

1. Urea,	644·62
2. Uric acid,	1·04
3. Fixed salts, earthy,	11·96
,, alkaline,	222·04
4. Difference,	118·89
Total,	998·55
A. Chlorine,	12·70
B. Phosphoric acid,	40·78

No. 4.

1. Urea,	554·00
2. Uric acid,	7·40
3. Fixed salts, earthy,	15·00
,, alkaline,	145·00
4. Difference,	96·60
Total,	818·00
A. Chlorine,	40·00
B. Phosphoric acid,	38·10

No. 5.

1. Urea,	630·00
2. Uric acid,	5·29
3. Fixed salts,	405·00
4. Difference,	289·91
Total,	1330·20
A. Chlorine,	79·20
B. Phosphoric acid,	23·72

Table G—*continued.*

No. 6.

	Grains per Day.
1. Urea,	484·30
2. Uric acid,	0·71
3. Fixed salts,	297·25
4. Difference,	268·99
Total,	1051·25
A. Chlorine,	36·08
B. Phosphoric acid,	29·43

Table H.—*Well-fed Vegetarians.*

No. 1.

1. Urea,	367·50
2. Uric acid,	0·50
3. Fixed salts, earthy,	20·30
,, alkaline,	364·00
4. Difference,	260·60
Total,	1012·90
A. Chlorine,	115·90
B. Phosphoric acid,	30·00

No. 2.

1. Urea,	578·81
2. Uric acid,	0·71
3. Fixed salts,	421·20
4. Difference,	236·15
Total,	1236·87
A. Sulphuric acid,	40·65
B. Phosphoric acid, with earths,	5·92
,, with alkalies,	26·55

No. 3.

1. Urea,	315·00
2. Uric acid,	1·69
3. Fixed salts,	261·00
4. Difference,	134·81
Total,	712·50
A. Sulphuric acid,	18·88
B. Phosphoric acid,	22·78

Table H—*continued.*

No. 4.

	Grains per Day.
1. Urea,	366·12
2. Uric acid,	2·48
3. Fixed salts,	249·20
4. Difference,	99·28
Total,	717·08
A. Sulphuric acid,	23·50
B. Phosphoric acid, with earths,	6·30
„ with alkalies,	21·24

No. 5.

1. Urea,	342·55
2. Uric acid [and Hippuric],	3·04
3. Fixed salts,	252·30
4. Difference,	177·71
Total,	775·60
A. Sulphuric acid,	21·00
B. Phosphoric acid, with earths,	3·46
„ with alkalies,	17·34

The preceding pages contain the facts which were observed during my investigation; in Part IV. I hope to draw my inferences from these facts, and to establish the general outlines of a Theory of Work applied to Man considered as a Machine, Mechanical and Mental.

(*To be continued.*)

Art. II.—*Report of Cases which occurred in the Parsonstown Workhouse Infirmary.* By Thomas Woods, M.D.

Two years ago I was placed in charge of the Parsonstown Workhouse Infirmary and Fever Hospital; and, as "a new broom sweeps clean," I commenced by endeavouring to classify, to a certain extent, the inmates. For instance, I found patients of the worst character, and affected with syphilis, mixed up with the other patients, both in the male and female wards. I procured for these separate apartments, in which they are treated altogether apart from the other paupers—thus avoiding both moral and physical contamination. I also found that no midwifery ward was appropriated for confinements, but that in the

general ward, amongst all the other cases of sickness, the accouchements took place. Decency and convenience alike suggested a separate room for these occasions, and I succeeded in obtaining it. Other lesser arrangements for classification added greatly to the comfort and usefulness of the hospital ; and I mention these particulars in order to direct the attention of medical officers, whose hospitals are similarly circumstanced, to the advantages I feel from them.

A workhouse hospital, for the number of patients it contains, is not the best field for interesting or instructive cases. The majority of its inmates are persons nearly approaching the natural term of life, the peculiar feature of whose existence is the entire indifference to the approach of death. Nevertheless, in the course of two years in every hospital some cases will occur which deserve recording. I have taken notes of some ; and, in the hope that they may be useful, I have determined to publish them.

The first case to which my attention was particularly directed was one of—

Prolapsus Ani.—With reference to this, the following is extracted from the note-book :—Biddy Grattan, aged six years, suffering from prolapsus ani for nearly two years. The prolapsed part cannot be returned ; it is about three inches in length, and the size of a lemon. The mucous membrane lining the tumour is congested. The child is emaciated and cadaverous. A large abscess is forming on the thigh. There is occasional diarrhœa, and no appetite.

The prolapsed rectum was rubbed over with nitrate of silver in substance. The protruded part became smaller, and the nurse was able to return it, but after a few hours it came down again. Strong nitric acid was then applied, by drawing a glass rod, dipped in the acid over the protruded bowel, a quarter of an inch wide on each side. The bowel was then returned, but it prolapsed the next day. The application of the nitric acid was repeated, a little more liberally ; the bowel was returned, and remained so for two days. The child got meat, and ate it. When the bowel protruded, it could be seen that where the nitric acid was applied the mucous membrane was removed. The nitric acid was again applied, the bowel returned, and it did not again come down. The acid was put on the prolapsed bowel by drawing it in the way first mentioned four times in the week ; and the child perfectly recovered. The abscess which was forming on the thigh disappeared by absorption ; and in about two weeks after, the bowel remained

permanently up. The child—who for the last two years was a most miserable-looking object, emaciated, suffering, and constantly confined to bed, with a poultice to the prolapsed rectum —gained a healthy and cheerful look, and became the fattest pauper in the house, with good use of her limbs. The cure is permanent.

Shortly after taking charge of the hospital I had a post-mortem examination on a man, aged 60, who had been under treatment before I saw him. His symptoms during life were, great dyspnœa, with occasional exacerbations, so that he appeared to be affected with croup in its most frightful form. He had also considerable dysphagia, was emaciated, and had cough. The post-mortem examination showed the following appearances :—Lungs healthy, pericardium attached to sternum by lymphy adhesions ; pleuræ, particularly that of the left side, adhering to each other ; about four ounces of fluid in pericardium ; heart a little larger than usual, and very soft, showing fatty degeneration under the microscope. The base of the aorta was very much enlarged ; and a little higher, and extending posteriorly, was a large aneurismal sac, partly filled with coagulum, pressing on the trachea and œsophagus. The latter was very thin, and on the inside of the tube was an ulcer, exactly opposite to where the aneurism pressed. The trachea was inflamed internally, and some false membrane was present. This might have caused the difficulty of breathing ; at least, together with the pressure, it might have given the peculiar croupy sound. The treatment had reference to laryngitis. I do not speak of anything here but the post-mortem examination, as it was with that I was principally concerned. The valves of the heart were sound, except that the edges were a little thickened. The lining membrane of the aorta was studded with atheromatous deposits.

Dr. Wallace, of Parsonstown, and Dr. D. B. Jacob, now of Maryborough, kindly made this and most of the following post-mortem examinations for me.

A case of Bright's disease of the kidneys was admitted into hospital on the 27th of February, 1857. The man (Casey) was thirty-five years old, and presented the following appearances on admission :—General anasarca to a great extent ; pale, phlegmatic, and scrofulous aspect. He had a clean tongue and a weak pulse. No apparent affection of heart or liver ; kidneys did not act well. Had suffered, a few years before, from scrofulous affection of the hip-joint. About six months ago he re-

ceived a hurt in the back ; and about three months since, after exposure to wet and cold, the anasarca commenced. The man lived at an hotel as helper in the yard, and was constantly out in wet weather.

On admission, he was ordered a diuretic mixture of squills, acetate of potash, juniper, and digitalis, after having taken a few doses of gray powder.

March 1st. Continues in every respect as at first, except that ascites is now added to the other symptoms. The medicines were continued, and a blister applied to the right side. The urine, which is small in quantity, has a specific gravity of 1028, and is highly albuminous.

This man lived until November following, the disease not having been permanently benefited by any diuretics, tonics, or alteratives. The only medicine which gave relief was gallic acid, in doses of five grains three times a day, and a liniment of squills, digitalis, and soap liniment to the loins. The effect of the gallic acid, alternated with nitro-muriatic acid, was most remarkable. It not only seemed to make the anasarca disappear in some parts of the body, but it nearly entirely removed the albumen from the urine. Indeed, I fancied the man was recovering. However, he was suddenly attacked one day with rigors, which nothing could allay except very hot bricks applied to the loins. He then became exceedingly hot, and had afterwards immense perspirations ; in fact, went through a long-continued aguish attack ; and finally swelling all over his body from head to foot, became unconscious, and died in twelve hours.

The post-mortem examination showed fluid in the abdominal and pleural cavities ; a little fluid in the pericardium. The heart was larger than natural, and softened ; lungs healthy ; liver healthy ; kidneys about three times their natural size, and soft ; cortical substance, particularly, morbidly developed, contrasting strongly in paleness of colour with the red tubular portion.

No other morbid appearance presented itself.

Lupus.—A man, Egan, aged 60, suffered from lupus on the face for three years. "It is now (March, 1857) about the size of a half-crown, and has been gradually extending round the circumference." Many applications, he says, have been tried without effect. I sprinkled over the raw surface *dried* sulphate of zinc. It caused great pain, and a slough formed, which fell off in about a week. Healthy granulations sprung up, and the sore completely healed. This sore remained healed for about

eighteen months, and again resumed its first state. The sulphate of zinc had now no beneficial effect. This case is still under treatment.

Heart Disease.—Mary Cleary, aged 15, admitted 8th November, 1857, with the following symptoms:—Great lividity of the face, and difficulty of breathing; general anasarca, small pulse, livid tongue; cough, with scanty, frothy expectoration. Examination with stethoscope showed congestion of the lungs. Heart's action tremulous, with double bruit de soufflet; in fact, it was impossible to distinguish the sounds of the heart, they were so confusedly mixed up with each other. Ascites was present, and the urine was scanty and high-coloured. She was ordered a mercurial alterative, followed by diuretics and sedatives, with some relief to the breathing and anasarcous swelling, but only for a short time. She died in a few days.

The post-mortem examination showed the entire surface of the body very dark-coloured from venous congestion. Fluid in peritoneal, pericardial, and pleural cavities. Blood intensely black. The heart being examined, the mitral valve was found greatly contracted, so that a goose-quill could scarcely be passed through it; and round its edges a hard border of cartilaginous consistency. It could hardly be thought that the circulation could be kept up through it even for a time. All the abdominal viscera were congested, especially the kidneys, which were quite black.

Chest Disease.—James White, aged 60, admitted to hospital in May, 1858. His symptoms on admission were, great difficulty of breathing, inability to lie on the left side, yellowish colour of face and eyes, emaciation, cough, with bloody expectoration; pulse quick and low; left side of the chest sounded well on percussion, and the respiration was normal. On the right side dulness on percussion up to the nipple of the breast, both anteriorly and posteriorly, with complete absence of respiration. All above this space there were mucous rales and gargouillement. The right side was larger than the left. He stated that he had been ill for some months, gradually getting worse, and was constantly exposed to wet and cold. This patient died in about a month; and a post-mortem examination showed, as might be expected, immense collections of fluid in the right pleural cavity, with adhesions stretching from the pulmonic to the costal pleura. Diaphragm on the right side thickened and cartilaginous. Right lung greatly compressed by the fluid in the pleura, and converted into a mass of tubercular matter, softened and cavernous towards the apex. Heart

healthy, except that the right ventricle was dilated. Left lung healthy; liver enlarged and congested; stomach healthy.

Judging from the appearance and the history of this case, it seemed to have commenced as pleuro-pneumonia, ending in tubercular abscess and effusion into the pleura.

Chronic Inflammation of the Brain, with Tubercular Tumour.—Larkin, aged forty-five years, had fever in 1857. Admitted shortly afterwards to Workhouse Infirmary, complaining principally of pain across the top of his head, running down to the right temple. He has (October, 1857) an anxious, suffering appearance, with a peculiar fixed eye, a contracted pupil, and slightly congested conjunctiva. Low pulse and pale countenance, except when flushed in pain; stomach not out of order; bowels regular, and good appetite. From the time of his admission all these symptoms continued, and gradually the left arm and leg became paralyzed; but the tongue was always protruded in a straight line, and was somewhat redder than natural. After some time, great pain was felt in the left arm and leg, which sedatives did not relieve, and latterly the same arm and leg became not only incapable of being moved, but the flexor muscles of both contracted, so that the hand was firmly pressed against the chin, and the heel against the buttock of the same side. There were twitching of the left side of the face, and during the last month of his life (July, 1858), great emaciation, and passing of fæces under him, not, however, unconsciously, but from inability to move. His speech was thick, but otherwise not altered, and his intellect was not at all affected.

Post-mortem examination showed the brain congested slightly, with an adhesion between the dura and the pia mater at the vertex, about one inch in diameter. In the lateral ventricles there were about two ounces of fluid, and at the base of the brain, attached to and beneath the crus cerebri of the right side, a tubercular mass, of about the size of a small hen-egg.

This man was apparently healthy before he had fever, with the exception of suffering from what were thought to be slight rheumatic pains.

Hydrocephalus.—Two children died in the Fever Hospital this month (October, 1858), after suffering from the usual symptoms of acute inflammation of the brain, commencing with shivering and fever, and ending in convulsions, coma, and death. In one case the hands and arms were rigidly flexed, and kept close to the chin, and in both the pupils were dilated and immovable.

Post-mortem examination showed great congestion of the

vessels of the pia mater, and, to a less extent, of the brain. In both cases there were adhesions between the dura and pia mater, and lymph effused at the vertex. In one case the lymph was spread out a good deal between the two membranes, and a great quantity was effused at the base, just behind the pons. In both cases there were about three ounces of fluid in the ventricles.

In one of these cases the symptom of continued flexion of the muscles of the arm, so that the hands were kept clenched and pressed against the chin, greatly resembled the same in the preceding (Larkin's) case. Although the disease under which the latter laboured was of a chronic character, and was the result of a tubercular development in the brain, it was not unlike the hydrocephalus in the effects produced.

The tumour in the one case, and the lymph in the other, were situated very much in the same place, and both might have produced the effusion into the ventricles, and the pressure on the same part of the brain might have occasioned the same symptoms; in fact, the mechanical effects, in both instances, were similar, although the diseases which produced them were different.

Œdema of the Glottis; Tracheotomy; and Death from Polypus of Heart.—Minnoge, aged 35, in hospital with secondary syphilis; phagedenic sores on several parts of the body. He was attacked some months ago in a similar manner, but apparently recovered under the use of iodide of iron. Since the sores reappeared, the iodide had no salutary effect. He was, therefore, ordered small doses of bichloride of mercury. He has small abscesses on the cheek and under the chin, and his general appearance is very cadaverous. In September (1857), after having been a second time in hospital, he complained of soreness of the throat, accompanied by hoarseness. There was nothing, however, to be seen in the threat. Greatly emaciated. The mercury was stopped, and iodide of iron again ordered. In a few days after (Sept. 30) he was attacked with great difficulty of breathing. No cough or discharge accompanied the dyspnœa After a few hours the breathing became so difficult that it was quite evident he must die if not relieved. I accordingly, at 10 o'clock P.M., opened the trachea, but before I had my preparations made for doing so, the unfortunate man had nearly ceased to breathe. He was unconscious when the operation was performed, and some time afterwards he said "he knew nothing from *the time he died* until he found himself surrounded by the persons at his bedside." The

breathing was quickly and efficiently performed through the tube in the trachea.

October 1st. Everything progressing favourably. Patient has taken some wine and broth during the night; breathes freely; continue the broth.

2nd. Tube required to be taken out to be cleaned, constantly filling with mucus. Slight bronchitis. Ordered a mixture of hydriodate of potash and tartar emetic in water.

3rd. Slept well, and is quite easy. Can breathe a little through the mouth. Still, slight bronchitis, but not increasing.

From this date until November 3rd he continued to progress favourably. No bronchitis, the first attack having disappeared in a few days. No particular unpleasant symptom of any kind. He can breathe through the mouth, but not sufficiently well to dispense with the trachea tube. He slips it out occasionally to clean it. He is, however, emaciated, although he takes a fair supply of nutriment. He has occasionally difficulty of breathing, although the tube is open.

On November 3, at 5 o'clock A M., he experienced great difficulty of breathing, to relieve which he removed the tube, thinking it was filled up. It had not, however, the desired effect. He felt great pain and weight about the region of the heart. The breathing became more oppressed, and, in spite of everything that could be done to relieve him, he expired in about fifteen minutes.

Post-mortem examination showed some œdema of the glottis. When the chest was opened, the lungs were found collapsed, and much spotted with carbonaceous deposit, but otherwise healthy. The heart was somewhat enlarged generally, and congested; the left ventricle thickened, and in the right ventricle a fibrinous polypus, about two inches long, adhered to the fleshy columns by a thin root. At first sight it appeared to be a clot, but examination showed its real character. It is probable that this polypus was the immediate cause of death, by falling against and stopping up the pulmonary artery.

Cancerous Degeneration.—Egan, aged 36. Admitted to hospital, September, 1857. Great emaciation and distention of abdomen; fluctuation in abdominal cavity, and a hard tumour occupying the epigastrium and right and left hypochondria; painful on pressure; constant retching; some diarrhœa; hectic fever, and great weakness. Died in two days.

Autopsy.—Large quantity of fluid in abdominal cavity. No signs of peritonitis. Liver enormously enlarged, presenting externally a knotty, indurated, and cancerous appearance,

extending three or four inches below the ribs, and pressing the stomach much beneath its natural situation; its internal structure, a pulpy, puriform mass throughout; a large cyst in left lobe, containing about four ounces of serous fluid; gall-bladder full of bile; liver weighed nine pounds. In the stomach, surrounding the pyloric orifice, was a cancerous mass, about the size of a large apple. Pancreas a cancerous mass; mesenteric glands enlarged and reddened; stomach and intestines blanched; kidneys healthy.

It is quite inexplicable how life could have been continued with such an almost universal destruction of all the organs for the preparation of nutriment.

Scrofulous Ophthalmia.—During the last two years there were many cases of scrofulous ophthalmia, although, judging from previous returns, not so many as formerly. Many of these cases occurred in eyes already possessed of nebulous corneæ.

The recent cases were in almost every instance cured by timely treatment. I generally gave three doses of calomel and rhubarb, one each night, and afterwards the syrup of iodide of iron, dropping into the eyes twice a day a solution of nitrate of silver, one grain to the ounce of water, and one-eighth of a grain of atropia. Sometimes the nitrate of silver solution was stronger. At the same time I used an external lotion, frequently applied, of acetate of lead, two grains to the ounce of water. These means, with blisters to the temple, generally made the patient well for the time. Nutritive diet was also found necessary; but the same individuals were constantly returning. However well they appeared to be when leaving the hospital, they were sure to come back again after a shorter or longer time, affected in the same way. I remarked in some children's cases that the scrofulous ophthalmia attacks were induced by any amelioration in porrigo of the scalp, to which many of them were subject, and that an aggravation of the latter relieved the ophthalmia.

I tried for these cases a solution of iodide of iron in cod-liver oil. It is a difficult matter to dissolve the iodide in the oil in the ordinary way, but I succeeded easily, by first making a solution of the iodide in chloroform, and then mixing the solution with the oil. I mention the use of this mixture chiefly for the purpose of mentioning this easy method of getting the solution for others who wish to try it, but I cannot say it did much service.

Since the foregoing cases were written, an inquiry has been

made by the Board of Guardians of this Union into what some few of the members consider a great extravagance. They have remarked that during the last two years, that is, since I got charge of the hospital, more extra diet in the shape of meat, wine, &c., has been given to the paupers than formerly, and they very properly called the attention of the Board generally to the subject, not with the object of depriving the patients of any necessary food, but that it might be seen whether the extra food was really required, or otherwise. The inquiry showed that more extra diet, and that to a considerable amount, was used; and in order to see what result was produced by this outlay, I examined the several entries in the books of the hospital. I knew that I ordered as closely as possible only as much food and stimulants as were necessary, in my opinion; but if the patients, before I went to the hospital, received much less, I should either have erred in judgment, or some result should appear different from what took place previously.

The examination of the books showed me I was not wrong. In the first place, the number of deaths in the year after I took charge fell from $12\frac{3}{5}$ per cent. to $10\frac{1}{5}$ per cent. of the hospital patients; and, secondly, the average daily number in hospital during the two last years, that is, the years they received more extra diet, was $8\frac{1}{2}$ less than in the previous two years, although there was a greater actual number of patients admitted—919 to 888; in other words, the patients were kept in hospital a much shorter period, amounting to $8\frac{1}{2}$ every day, with a consequent saving to the Union of £72 in diet and £30 in medicine. The extra diet did not cost nearly so much, so that the use of a more liberal diet, so far from being what at first sight appeared a loss, was in reality a great saving. And in reference to the fall of number of deaths in hospital, I have no doubt but that it also resulted from the use of a more liberal diet, for I examined the last Annual Report of the Poor Law Commissioners, and, taking the returns of all the Unions admitting up to and under 800 paupers, I find that in those where the average weekly expense is under 2*s.*, the average per-centage of deaths is nearly $9\frac{1}{2}$ on the general number admitted; while in those whose average weekly expense exceeds 2*s.*, it is only 7. So that a somewhat more liberal diet given to the paupers in workhouses is, I believe, no extravagance, but a saving, and at the same time a certain means of adding to the duration of life.

Art. III.—*Notes on Gunshot Injuries, with a Return and Detail of Cases from the Mutiny in India; and a Description of the Preparations illustrating this subject contained in the Museum at Fort Pitt.* By G. Williamson, Staff-Surgeon.

(*Continued from* vol. xxvii. p. 360.)

Class VIII.—Gunshot Wounds of the Upper Extremities.

Division 1.—*Simple Flesh Contusions and Wounds.*

Slight, 39; severe, 8. Total, 47.

Of these 30 have been sent to duty; 6 to modified duty; 6 invalided; and 5 remain undisposed of.

All were wounds by musket-ball, with the exception of 3 by round shot, 2 by shell, and 1 by slugs; 28 were wounded in the shoulder and arm, and 11 in the forearm and hand. The wounds were, with few exceptions, all healed, but in a number of cases there was more or less muscular contraction, and consequent loss of use and power in the arm, resulting from the patients' keeping the wounded limb in one particular position for months. In many cases the arm had become apparently perfectly useless, and in some cases even an incumbrance, so that I have been asked to remove it by amputation. This system of nursing their wounded limbs is brought about by trying at first to save themselves pain on any attempt at motion being made, and also from an idea that if they are invalided for a wound received in action they will be granted a higher pension than for any other disability.

In some the fingers were so contracted, and the nails so long, hard, and horny, resembling claws, that they had produced ulceration in the palm of the hand; to remedy this, the bath-man was supplied with a pair of strong scissors to keep the fingers of such patients in proper order.

In others the elbow-joint was contracted, distorted, and perfectly firm and rigid, and in a semi-bent position, and the fingers powerless from want of use.

The mode adopted for these contractions was simple, and consisted in forcible extension, the patient at the time being generally under the influence of chloroform; strong, straight, splints of different sizes were used; they were well padded, and covered with linen firmly sown down. Before applying the splint, the arm was bandaged with a flannel roller, and the splints, as stated, were strong and of a good breadth, and also of such length as to extend beyond the bones included in the contraction. For instance, when the elbow-joint is contracted, the splint should extend from the fingers beyond the shoulder

so as to afford plenty of leverage and purchase, as a very considerable degree of force has to be used. These splints were used almost daily on different patients, and with great success. The number of cases in which perfect cures were effected was great, and in others the condition of the limb was much improved. In none was there any serious injury or bad effect resulting from this process. Occasionally a considerable amount of inflammation and swelling follows, with vesication of the integuments; this always subsides under cold applications, and if the limb should again become contracted, the splint should be reapplied as soon as possible. In some cases a single application of the splint sufficed to straighten the contracted part, but more frequently the splint had to be applied several times, at intervals of a day or two. Sometimes the pain is so great that the patient cannot bear the application of the splint for more than a few hours. He ought, however, to be induced to keep it on as long as possible.

Of the 8 cases returned as severe, 3 were produced by round shot, causing severe laceration and destruction of the soft parts; 1 was by musket-ball through the biceps, along with 3 bayonet wounds of the shoulder, followed by sloughing; in 2 cases by a musket-ball through the arm, followed by sloughing; the last was a severe shell wound of the forearm.

Division 2.—*With Contusion and partial Fracture of Long Bones, including Fracture of the Clavicle and Scapula.*

Under this head 30 have been admitted, of which 13 have been sent to duty; 4 to modified duty; 5 invalided; 1 died of pyemia; and 7 remain undisposed of.

All were produced by musket-ball, with the exception of 1 by a piece of a shell. 14 were injuries of the scapula; 4 of the clavicle; 6 of the humerus; 3 of the radius; and 3 of the ulna.

Of the 14 cases of partial fracture of the scapula, 6 have been sent to duty; 2 to modified duty; 2 invalided; and 4 remain undisposed of. The 4 remaining may be included amongst the invalided, which makes a total of 6 discharged the service.

In some cases the ball entered through the fold of the axilla, and passed directly through the scapula. In others the ball entered above the clavicle, and passed through the superior angle of the scapula. In one case the ball injured both scapulæ, passing from side to side; in another the ball seemed to have gone between the scapula and ribs. Fractures of the

scapula are not dangerous unless they shatter the neck of the bone, or cause a fissure into the joint. Abscesses are apt to form under the fascia of the back, and require to be laid freely open by incision. Necrosis is not so frequent a result of gunshot fractures of the upper as of the lower extremity.

The following case is an example of abscesses forming in the neighbourhood of the scapula in gunshot wounds of this region:—

84th Regt.—Private Thomas Herlihy, aged 28, wounded October 6, 1857, at Lucknow, by a musket-ball which entered at the upper edge of the right scapula, about an inch below the spinous process, and passed out opposite to the spinous process of the fourth dorsal vertebra. Abscesses formed over the scapula, and were opened. The bone was injured, and several pieces of bone have come away at different times. All the wounds are now healed. He complains of inability to raise the arm from the shoulder-joint above the head, and also to carry his knapsack; his arm is, however, stout and muscular. September 3, 1858. Modified duty.

Of the 4 cases of partial fracture of the clavicle, 2 have been sent to duty; 1 invalided in consequence of loss of power in right arm; the fourth still remains undisposed of: in this case the aperture of entrance was healed on arrival here, but that of exit was still open, and led down to bare bone in the clavicle.

Of the 6 cases of partial fracture of the humerus, all occurred in the shaft of the bone; 1, as already stated, died of pyemia; 3 were sent to duty, and 2 invalided. The case of Private John Lloyd is interesting, as illustrating (Preparation No. 3629) the appearance of a partial fracture or indentation of a long bone, caused by a musket-ball, which was followed by necrosis of the part injured, while the remaining portion of the thickness of the shaft still continues intact; also the wound remaining open and suppurating, rendering the patient liable to blood-poisoning by the absorption of pus.

9th Lancers.—Private John Lloyd, wounded at Delhi, August 12, 1857, by a musket-ball in the right shoulder, which passed through on the inner side of the humerus, and made its exit on the posterior side of the arm. Both wounds healed before leaving India, but broke out on board ship.

August 2nd. The aperture of entrance is large, about an inch in diameter, and discharges freely. General health indifferent, and of a scorbutic tendency.

5th. He complained of dyspnœa; the wound looked slug-

gish; tongue coated; gums spongy; suffered from pains in the back and loins, especially in the right hypochondriac region.

7th. The dyspnœa had increased, and his cough was troublesome; the sputa were purulent, and very tenacious; on applying the stethoscope to the chest, mucous rales could be heard masking the heart's sounds; pain in the right side; pulse small and quick; epistaxis was so considerable as to weaken him greatly; slight diarrhœa.

9th. He still suffers from diarrhœa; very restless at night, seems to be in every respect worse.

10th. Complains greatly of pain in the right side; appetite very bad; suffers much from vomiting.

11th. Bowels not open to-day; his face looks anxious; eyes sunken; pulse very weak and quick; appetite entirely gone.

12th. Bowels not open for forty-eight hours; is getting very low; complains greatly of pain in the left side; expectoration thick and purulent.

13th. Died.

Sectio Cadaveris, twenty hours after.—External Appearances.—The aperture of entrance of ball, about an inch in diameter, was observed to be situated on the front of the right shoulder, and on inserting a probe it was found to proceed backwards, between the upper part of the shaft of the humerus and the large vessels and nerves of the axilla, none of which were injured, and passed as far back as the integuments on the posterior fold of the axilla, where the aperture of exit was seen to be closed. The track of the ball was of a dark colour, and in a sloughing state, and contained three small pieces of necrosed bone. A portion of the shaft of the humerus, on its inner side, about two inches below its tuberosity, was bare, and denuded of periosteum, and carious. There is also a depression in this situation from loss of bony structure, where the ball had caused a partial fracture, No. 3629. *Cranium.*—Membranes of brain much congested; the brain otherwise healthy, weight 3 lbs. *Thorax.*—There were five ounces of serum in the pericardium; heart healthy, weight 11 oz. The mucous membrane of the larynx, trachea, and bronchial tubes, as far as it could be traced into the lungs, of a deep purple colour, and highly congested; the right pleural cavity free from adhesions; the left pleural cavity slightly connected to the walls of the chest from recently effused lymph, a thin coating of which covered the inferior lobe. On making a section of the lungs, they were found œdematous; several small sacs, the size of a bean, containing deposits of pus, were found in the structure of the inferior lobe of the left lung, and the

surrounding substance was somewhat condensed; weight 4 lbs. 4 oz. *Abdomen.*—The liver was much enlarged, and of a dark colour, the structure being otherwise healthy; the gall-bladder was filled with a thin watery bile; weight 6 lbs. 14 oz. The spleen was also greatly enlarged, the structure being soft and easily broken up, weight 4 lbs. 4 oz. The kidneys were very much enlarged, and presented the appearance of granular degeneration in the second stage, some of the tubular portions having disappeared; weight, right, 14 oz., left, 13½ oz. The stomach and intestines were slightly congested, and of a dark slate colour from a carbonaceous deposit.

Of the 3 cases of partial fracture of the ulna, 2 have been sent to duty, and 1 to modified duty; 2 were in the shaft of the bone, 1 by a piece of shell, close to the elbow-joint, resulting in anchylosis.

61st Regt.—Edwin Carter, aged 37, wounded at Delhi, September 15, 1857, by a piece of shell which struck the inner side of the right elbow-joint, a little below the olecranon, injuring the bone in the vicinity of the joint, without producing rupture of the skin; considerable pain and swelling of the joint ensued, which were relieved by incisions giving exit to a large quantity of pus. One large piece of bone came away. The wound did not heal for five months.

September 5th. Wound healed; forearm in a semi-bent position, and elbow-joint completely anchylosed.

October, 1858. Modified duty.

One case of partial fracture of the radius was sent to duty.

Division 3.—*Simple Fracture of the Long Bones by Contusion from Round Shot.*

2 have been admitted, and 2 invalided; 1 was a case of simple fracture of the ulna, with contusion of the wrist, followed by abscesses in the hand; the other is a case of fracture of the clavicle, still ununited, with loss of pulsation and diminished temperature in the injured arm.

32nd Regt.—Private James Bailey, wounded at Lucknow, September 2, 1857, by a round shot, on the left side of the chest, breaking the first and second ribs, and centre of left clavicle, also contusing the shoulder.

July 13, 1858. The fracture of the clavicle is still ununited; has lost power in the arm, and cannot use the fingers; no pulse can be felt at the wrist, and the left arm is of a lower temperature than the right.

August 5, 1858. Invalided.

Division 4.— *With Compound Fracture of the Humerus.*

17 have been admitted under this head. 3 have been sent to modified duty; 13 have been invalided; and 1 remains undisposed of. 1 was caused by a piece of a shell, and the others by musket-ball. All were fractured in the shaft of the bone, with two exceptions; 1 of them was through the head of the humerus, anchylosis of the shoulder-joint resulted; the other was through the surgical neck of the bone; 1 only remained unhealed on arrival here.

In almost every case of fracture implicating the humerus or bones of the forearm, there was great muscular contraction and rigidity of the tendons and ligaments around the elbow-joint, and the fingers were bent and contracted, requiring forcible extension to ameliorate their condition, and in some to effect a cure.

In compound fractures of the upper extremity primary amputation is never resorted to except in very severe and hopeless cases of gunshot wounds. The following is a case of complete fracture of the humerus, with the ball lodged in the bone below the brachial artery.

53rd Regt.—Private Patrick Radding, aged 29, wounded, November 1, 1857, by a musket-ball, which entered on the outer side of the left humerus, about two inches above the elbow, and appears to have passed through the bone to the inner side, where it still remains imbedded in the bone; several pieces of bone have come away.

June 11, 1858. There is now a firm, hard substance on the inner side under the brachial artery, and he cannot straighten the arm in consequence of contraction of the biceps; there is a deep depression at the entrance of the ball. As the ball did not cause much annoyance, it was not considered advisable to cut down upon it, and remove it, particularly as the man was averse to the operation.

August 26th, 1858. Invalided.

The next is a case of fracture of the surgical neck of the humerus, the shoulder-joint remaining sound.

78th Regt.—Private Geo. Mathews, wounded at Lucknow, September 25, 1857, by a musket-ball, which entered in front of the left shoulder, through the anterior fold of the axilla passed directly backwards, and came out at the posterior surface of the arm at the posterior margin of the deltoid behind the joint, causing a comminuted fracture at the surgical neck of the humerus; profuse suppuration ensued; several fragments of bone have come away.

July 11th. Apertures of entrance and exit of ball remain open; small pieces of bare bone can be felt; there is some enlargement of the bone at the seat of injury from deposition of new bone. The shoulder-joint is apparently sound, although he cannot move the arm, but he has perfect use of the forearm and hand.

The following is a case where the ball passed through the head of the humerus, followed by abscesses and anchylosis of the shoulder-joint.

75th Regt.—Corporal John Ryan, aged 31, wounded at Delhi, August 12, 1857, by a musket-ball, which entered the head of the left humerus, and passed out about two inches from the spinous process of the vertebra, between the seventh and eighth ribs; stated that he spat up blood for three weeks after; abscesses formed, and numerous pieces of bone came away from the shoulder.

July 20th, 1858. Wound healed; shoulder-joint anchylosed. It is not certain whether the lung was wounded or not.

October 6, 1858. Invalided.

The following is a case of ununited fracture of the humerus, from India, in an officer.

Major M. had his right humerus severely shattered in its middle third by a musket-ball, in June, 1858, at Juydespore; the shot was fired by a Sepoy who was within a few yards of him. Several pieces of bone came away at the time, and since then a considerable number of small pieces.

March, 1859. There is now a space of about two inches between the ends of the bones, no union having taken place, and there is a slight discharge from a sinus which remains open. There still appear to be some necrosed portions of bone to come away; and it is not thought advisable at the present time to perform any operation with the view of effecting union.

No. 2924. Shows deficiency of a large portion of the lower part of the shaft of the humerus, from necrosis, in consequence of gunshot wound.

No. 2925. Humerus, the shaft of which has been shattered by gunshot, and firmly consolidated by osseous matter; a large splinter, which was completely detached, has become perfectly united to the fragments. From Patrick Waldron, 87th Regt., who received a fracture of the arm in the Burmese war. The ball entered between the outer edge of the biceps and insertion of the deltoid, passed through the os humeri and triceps, and made its exit on the inner side of the arm. The power of the limb was never restored; he subsequently died of apoplexy. When the arm was examined after death the external cuta-

neous nerve was found to have been wounded, and at the injured part was converted into a cartilaginous substance.

b.—With Compound Fracture of the Radius.

18 have been admitted. 1 has been sent to duty; 2 to modified duty; 14 invalided. 1 was produced by a piece of a shell, close to the elbow-joint, followed by anchylosis; and the others by musket-ball; only 1 remained unhealed.

In some of these cases there was great comminution of bone and loss of substance. In some instances as much as two and three inches of the shaft were deficient, and in all there was more or less contraction of the fingers, and consequent impaired use of the hand and forearm, so as to render the men unfit for service. In 2 cases the fracture was close to the wrist-joint; in 1 case the fracture remained ununited, although the ends of the bone were in contact; in one the ball was supposed to be lodged and impacted in the bone, and was cut down upon, but could not be found.

The following is a case of fracture of the radius, with probable injury of the median nerve.

88th Regt.—Private Robert Buchanan, aged 20, wounded November 26, 1857, by a musket-ball, which entered on the anterior suface of the arm, about three inches below the elbow-joint, and passed out on the posterior surface, opposite to the place of entrance; the radius was fractured, and several pieces of bone have come away; the median nerve has also, probably, been wounded.

July 11, 1858. He has now completely lost the power of motion and sensation in the hand, which hangs powerless by the side, and the lower extremity of the ulna projects as if the hand was partly dislocated.

July 31, 1858. Invalided.

The next case is one of severe comminution, with loss of about two and a half inches of the shaft of the bone.

60th Rifles (1st Battalion).—Private John Kerr, aged 19, wounded at Delhi, June 14, 1857, by a musket-ball, causing a compound comminuted fracture of the right radius about its middle, doing also much injury to the flexor tendons; several pieces of bone were taken away at the time.

July 20, 1858. Wound healed; there is loss of a portion of the shaft of the radius for about two and a half inches; he cannot use the fingers, or pronate or supinate the hand.

July 21, 1858. Invalided.

The following is a case of fracture with the ball lodged between the comminuted portions of the radius.

75th Regiment.—Private Wm. Clarke, wounded at Delhi, September 14, 1857, by a musket-ball, which struck the outer side of the forearm at it upper third, fracturing the radius, and lodged.

March 17, 1858. An incision was made and several loose pieces of bone taken away, but the ball could not be found.

July 20th. Entrance wound of ball healed; the incision made for extraction of the ball still remains open; cannot pronate and supinate the hand, and has lost the power of the arm.

October 16, 1858. Invalided.

No. 2926. Radius, the shaft of which has been fractured by a gunshot, and reunited by new osseous matter, and firmly consolidated thereby to the ulna.

c.— With Compound Fracture of the Ulna.

7 have been admitted, of whom 2 have been sent to duty; 1 to modified duty; and 3 invalided; and 1 remains. All were by musket-ball, and were healed on arrival. In 1 case ligature of the radial artery had been performed on account of sloughing, which is detailed under "Ligature of Arteries."

d.— With Compound Fracture of the Radius and Ulna.

3 have been admitted. 1 sent to duty, and 2 invalided. In 1 of these cases the fracture of both bones was produced by a piece of telegraph rod, which the mutineers fired when they became short of ammunition. The fracture was in the lower third near the wrist. In the other case the fracture was caused by the soldier falling from his horse in action.

DIVISION 5.—*Penetrating, perforating, or lacerating the several Structures of the Carpus and Metacarpus.*

Under this head there have been 26 admissions, of which 5 have been sent to duty; 7 to modified duty; and 13 invalided; 1 remains undisposed of. The proportion invalided in these injuries is great, and shows their severity. In some cases the ball completely perforated the carpus or metacarpus; in others it struck the bone in a slanting direction, and passed out, producing more or less injury to the bones, tendons, and ligaments, so that in almost every case there was contraction and rigidity of parts, with distortion, want of power, and otherwise impaired use of the hand and fingers resulting. Whenever it was requisite, forcible extension was resorted to. In two cases the wrist-joint was anchylosed.

In the following case the ball still remains in the fleshy part between the thumb and fore-finger, and it was not thought

expedient to cut down upon it and remove it, in consequence of its not producing much inconvenience, and also from the patient objecting to the operation, fearing that he might be attacked with lock-jaw, and especially as he was otherwise strong and healthy.

60th Rifles (1st Battalion).—Corporal Denis Bergin, aged 30, wounded at Delhi, June 15, 1857, by a musket-ball which entered on the posterior surface of the left arm, about two inches above the wrist, passed between the radius and ulna, and made its exit on the anterior surface of the forearm. On July 14th he received another wound from a musket-ball, in the left hand; the ball entered on the posterior surface between the thumb and forefinger, and still remains in.

July 20, 1858. Wounds healed; has lost considerable power of the finger, and the wrist-joint is anchylosed; the ball is felt between the thumb and forefinger.

21st. Invalided.

84th Regt.—Private Thomas Rushworth, aged 28, wounded at Lucknow, November 17, 1857, by a musket-ball, in the left wrist, which entered on the front nearly in the centre, passed directly through, and made its exit on the posterior side; several pieces of the carpal bones were removed at the time, and great swelling of the hand ensued.

August 16, 1858. Wounds healed; there is anchylosis of the wrist-joint, with impaired use of the hand.

September 2, 1858. Sent to modified duty.

Division 6.—*Dividing or lacerating the several Structures of the Carpus and Metacarpus.*

9 have been admitted; 4 have been sent to duty; 2 invalided; and 3 remain.

Class IX.—Gunshot Wounds of the Lower Extremities.

Division 1.—*Simple Flesh Contusions and Wounds.*

Slight, 87; severe, 13; total, 100.

Of the total 100 cases, 63 have been sent to duty; 6 to modified duty; 13 invalided; and 18 remain undisposed of.

On comparing the number of gunshot wounds of the upper with that of the lower extremities, it will be noticed that they are very nearly the same, viz., 159 in the upper, and 162 in the lower. There is, however, a considerable difference as to the number of flesh gunshot wounds, there being 100 in the lower, and only 47 in the upper extremities. 5 were shell wounds; 8 by grape-shot; 1 by a brick-bat; 1 by a rifle-ball; and the

remainder by musket-ball. 12 were wounded in the hip; 26 in the thigh: and 62 in the leg. In 2 cases balls were extricated from the fleshy part of the thigh, at Fort Pitt; and in another case from the perineum, immediately over the bulb of the urethra, the ball having entered on the outer side of the thigh, opposite the trochanter major; in 3 cases the wounds were very close to the femoral artery; and in 1 the ball still remains in the thigh. This man is returned under "Amputation of the Finger," but the other wound is interesting, and must be noticed in this place: the ball must have grazed the femoral artery and vein; on inserting a probe into the fistulous opening, the ball could be distinctly felt deep behind the artery. Of the 13 severe cases, 1 was by a ball which is lodged in the tuberosity of the ischium; 2 were from round shot in the thigh, followed by sloughing: several were ball and shell wounds in the thigh, followed by sloughing; 1 was by a rifle-ball in the thigh; 1 by a ball in the thigh close to the femoral artery, injuring the sciatic nerve; and in 5 cases the wounds were from balls in the fleshy parts of the leg, followed by sloughing.

In a number of cases there was great contraction and rigidity of the hamstring muscles and ligaments around the knee-joint, also in the muscles of the calf, and around the ankle-joint, requiring forcible extension. Many of them, on arrival, walked with crutches, the leg suspended in slings, and the foot pushed out behind; the crutches were taken from them, and the limbs placed in splints and extended; and with the same results as in the upper extremity, the greater number being much improved in condition, and several perfectly cured.

The very indolent character of open sores after gunshot wounds is worthy of remark. The men were apparently in good health, had lived well both in India and on board ship, and were generally untainted with scurvy; still, the ulcers resisted every mode of treatment,—lotions of every description, blisters, strapping, filling them with wax, &c.,—nothing would induce granulations, or a healthy action.

The following is a case where a ball entered posteriorly in the centre of the buttocks, and lodged in or near the pubes; the ball could not be felt by the finger from the perineum, but it was detected by the long probe through the aperture in the hip.

10th Regt.—Private John Ferguson, wounded at Benares, June 4, 1857, by a musket-ball, which entered the centre of the right buttock, and passed forwards and downwards, and is now lodged in or near the ramus of the pubes.

July 13th. The aperture of entrance on the centre of the right hip is still open, and the ordinary probe goes in its entire length without feeling any foreign body; the long probe can detect the ball lying near the pubes.

July 17, 1858. Invalided.

In the following case the ball must have grazed, or at least passed very close to the femoral artery, and lodged deep beneath it.

84th Regt.—Private Thomas Bulger, aged 33, wounded at Cawnpore, November 16, 1857, by a musket-ball, which struck him on the left hand, fracturing the first, second, and third fingers, and then passed through the anterior and outer part of the upper third of the left thigh from behind forwards. Wounded by a second musket-ball in the anterior aspect of the left thigh, the ball entering about three inches below Poupart's ligament, close to the course of the femoral artery, where it lodged. Amputation of the fore and middle fingers, between the first and second phalanges, was performed four days after.

August 16th. Covering of stumps of fingers good; motions of ring and little fingers impaired; perforating wound of thigh healed. The wound where the ball is lodged still remains open; there is only a small sinus, through which the ball can be felt, situated close to the inner side of the femoral vein; attempts were made to dilate the wound by tents, as it would have been rather hazardous to cut down upon it, being so very near the femoral artery and vein; the man objected strongly to have an incision made for its removal, and, as the wound had closed, he was discharged the service, October 15, 1858, on account of loss of fingers by amputation, under which head he is included in the Return, although noticed in this place for the wound in the thigh.

Division 2.—*With Contusion and partial Fracture of Long-Bones, and of the Bones of the Pelvis, in their relation to the Lower Extremities.*

28 have been admitted, of whom 8 have been sent to duty, 4 to modified duty, 10 invalided, and 6 remain undisposed of. 5 were partial fractures of the ilium, 3 in the thigh, 14 in the tibia, and 5 in the fibula; 13 were caused by ball, 3 by grape, 1 by round-shot, and 1 by shell. Of the 5 cases of fracture of the ilium, several were very severe; in 2 the balls were supposed still to remain impacted in the ilium, but causing no inconvenience; in 1 a portion of bone, 2 inches in diameter, came away by necrosis; of the 3 cases of wounds

in the thigh, in 2 of them there was only slight injury to the femur; in the third case the ball entered in the popliteal space, and anchylosis of the knee-joint resulted; of the 14 wounded in the leg, there was 1 where the ball fractured the tibia, with, probably, a split into the ankle-joint; in 1 case sloughing followed, requiring ligature of the posterior tibial artery; in 1 a round-shot tore the soft parts extensively; and in 1 the greater portion of the tibia became necrosed, and was taken away. In a number of cases there was considerable contraction of the knee and leg.

The following is a case where a ball is said to be firmly impacted in the ilium.

10th Regt.—Private Robert Sherlock, wounded at Benares, June 4, 1857, by a musket-ball, which entered about two inches below the crest of the ilium, and is firmly impacted in the bone, as stated in the document. At a consultation held on November 17, 1857, at Dinapore, it was decided that at present an operation was not advisable.

July 12, 1858. Wound healed; ball cannot be felt through the soft parts, and it causes no uneasiness or pain to the man.

July 13, 1858. Sent to duty.

The next is a case of fracture of the ilium by grape-shot, followed by necrosis.

Preparation No. 3627 is the portion of the external table of the ilium, about two inches in diameter, which was removed from the following subject.

88th Regt.—Private Martin Ford, aged 20, wounded at Cawnpore, November 26, 1857, by a grape-shot, on the crest of the right ilium, immediately above the anterior and superior spinous process, where it lodged, and was extracted two days after; several pieces of necrosed bones have come away.

October 10, 1858. Wounds healed; there is a deep adherent cicatrix over the outer side of the hip, with stiffness and contraction of muscles.

October 15, 1858. Modified duty.

The following case is an example of a wound near a joint, producing such severe inflammation of the ligamentous structure and of the joint itself, as to cause anchylosis. This case was placed under this Division, as it was thought probable there was more or less injury to the bone, although it was stated in the report of the case that there was not any fracture.

60th Rifles (1st Battalion).—Private Edmund Miller, wounded at Delhi, September 14, 1857, by a musket-ball, which struck the centre of the popliteal space, but, as far as could be observed at the time, not entering the joint or caus-

ing any fracture; great swelling and effusion occurred, with considerable disturbance, and excessive pain on moving the limb, or even the mildest manipulation. The ball was extracted, with some difficulty, from the aperture of entrance, which rapidly healed, and again broke out.

July 20, 1858. Left knee anchylosed, but he is still able to walk.

July 22, 1858. Invalided.

The following case shows extensive necrosis of the tibia, which is a frequent result of injury or partial fracture of this bone.

75th Regt.—Private George Steptoe, wounded at Delhi, September 14, 1857, by a musket-ball in the left leg, which entered immediately below the tubercle of the tibia, and passed out on the outer side of the leg at its upper third; several pieces of bone came away from both wounds.

July 20, 1858. Exit wound healed, entrance aperture still open, and several other sinuses leading down to necrosed bone; tibia enlarged; integument livid and discoloured.

26th. Two pieces of bone, about two inches in length, were extracted from the centre of the tibia, at Fort Pitt.

Undisposed of.

The last case in this Division is an example of a longitudinal fracture into the ankle-joint, followed by anchylosis.

5th Regt.—Private William Burrowes, wounded at Juydespore, August 12, 1857, by a spent musket-ball, on the inner side of the right leg, about one inch above the ankle-joint; it was extracted immediately after by pulling out the sock and trowsers, which had been carried in with it; the tibia seems to have been splintered longitudinally into the ankle-joint.

September 26, 1858. Wound healed; ankle-joint anchylosed; there is a slight depression along the front of the lower third of the tibia; he walks lame.

November 21, 1858. Invalided.

Division 3.— *With Simple Fracture of Long Bones by contusion of Round Shot.*

None admitted.

Division 4.— *With Compound Fracture of Femur.*

8 have been admitted from India, of whom 2 have been sent to modified duty, 5 invalided, and 1 died. 1 double fracture, —one fracture being at the upper third, and one at the middle third; fracture at the upper third in 4; at the middle third in 3. By musket-ball in 7; by round-shot in 1; musket-ball

lodged in 3; not lodged in 5; wound healed on arrival in 5; unhealed on arrival in 3. Limb three inches shorter in 3, two and a half inches shorter in 1, one and a half inches shorter in 2, and one inch shorter in 2 instances.

Besides these 8 cases there is 1 (Private M'Crea[a]) of a simple fracture of the lower third of the femur, by round-shot, received in action, where amputation of the leg was performed at the tubercle of the tibia.

It is taught by most military surgeons that, as a rule, immediate amputation should be performed in all compound comminuted fractures of the femur; and that by attempting to save limbs more patients have lost their lives. It is also recommended in all cases of gunshot fractures of the middle and lower thirds of the femur, but especially in the middle third, that amputation should be performed; but in the same injury in the upper third, the limb should be preserved, as it has been found that amputation in the upper third of the thigh is almost certainly fatal, so that such a severe operation is not considered advisable when the prospect of success is so small, and by retaining the limb the patient is much more comfortable, with equal chances of saving his life. It may be mentioned that one case of amputation of the upper third of the thigh arrived from India: it was so high up that the stump could not be retained in the bucket of the artificial limb.

It appears from the result of the Schleswig Holstein war, that a considerable number of these cases were preserved with very useful limbs. The number which have arrived from India is very large in proportion, viz., 8 cases of compound comminuted fracture of the femur to the total wounded, 603. Of 2296 discharged the service at Chatham, in consequence of wounds received in the Crimean war, there were only 8 recoveries with the limb on. The success of these cases from India may, in part, be attributed by some surgeons to the ball of the old musket being smaller, and not producing such a severe fracture as that used by the Russians during the late war, but more to the dooley as a means of conveyance, and in part to the army having been better supplied with good food, clothing, &c.

Generally cases of gunshot wounds progress more favourably in hot than in very cold climates, especially when great attention is paid to cleanliness. These fractures are, however, in my opinion, as severe as could be caused by any Russian

[a] The history of this case will be found under "Amputation of the Leg."

ball, viz., in M'Carter's case, produced by round-shot, and Carty's, where there was a double fracture. And, looking at these cases, it appears to be still an open question as to the necessity of immediate amputation in all cases of gun-shot fractures of the femur. When the fracture is close to the knee, or if the bone is split into the joint, amputation will be necessary; when the bone is simply fractured, and not splintered to any great extent, the ball having traversed the limb, it seems to be advisable, under favourable circumstances as to after-treatment, to try and save the limb at whatever part of the bone the fracture has taken place; when the femur is more extensively shattered, recourse must, of necessity, be had to amputation. A great deal must also depend upon the kind of projectile: when from round-shot, there is generally great comminution, and little hope can be entertained of saving the limb; but recoveries under such unfavourable circumstances do occasionally take place, as illustrated by the case of M'Carter, 64th Regiment. The fact that three men were sent to modified duty shows that they must have retained very useful limbs, so as to be able to carry messages and to act as orderlies: more than three might have been sent, as far as the condition of the leg was concerned.

The case of Carty, 64th Regiment, is interesting as showing a double fracture, both firmly united, and the ball supposed to be lodged.

Ashworth had recovered with such a strong useful leg, that, if it had not been for the shortening of the limb, he might have gone to his duty in the ranks.

Hewitt had also a very useful limb, and would have been sent to modified duty if he had not been close upon ten years' service, when he could have claimed his discharge.

Collins also retained a very useful limb, and could walk a long distance with a stick; he was discharged by Horse Guards' order, after having been sent to modified duty.

Burke has also a very good limb, and is at modified duty.

Walmsley (death) is very interesting, as showing strong bony union at the trochanter, with the ball lodged between the fractured ends.

Hunter is able to walk about with very little lameness, and the sinus discharges very little. There appears to be a very extensive deposition of new bone, with thickening of the lower third of the femur, and central necrosis; the new bone extends so low as to encroach somewhat on the motions of the knee.

They were all, as far as can be ascertained, treated by the long splint, with the exception of M'Carter and Burke, who used M'Intyre's splint for some time.

The advantage of the dooley over the best constructed ambulance, for the conveyance of sick and wounded over rough roads during active military operations, is well shown in the result of these cases of compound comminuted fracture of the femur.

Why should not Government enlist and organize in India a corps of trained dooley-bearers for service with our regiments in every part of the world? All regiments in India have a certain proportion of dooleys and dooley-bearers attached to them permanently in the time of peace, and when on the line of march and on active service they are, of course, increased.

I would propose that one dooley, with the usual number of bearers, be part of the establishment of every regiment in time of peace; and the men, when not required with the dooley, could be very usefully employed about the barrack on fatigue duty, &c.

The best dooley-bearers generally come from the country around Cawnpore, and the lower provinces. It would not be advisable to take such men to the cold climate of England, but in India the extent of country is so great that we can choose men from a country still colder than our own. The little sturdy hill men, the "Ghoorkas," for instance, or (if they would not) any other hill tribes, might be trained into a most useful and serviceable corps, and would enable us to do away, in a great measure, with the sick ambulances; the dooley being only used for the worst cases. This appears to me to be a measure which could be carried out without much difficulty, if sufficient inducements as to pay, good treatment when in the service, and the promise of a pension when discharged, and sent back to their homes in India, were held out to them.

In the following case there was extensive laceration of the soft parts, and severe comminution of bone; large portions of necrosed bones were removed. The wound had never entirely healed; the limb was two inches and a quarter shorter than the other.

64th Regt.—Private William M'Carter, aged 26, nine years' service, was wounded on February 8, 1857, at Kooshat, in Persia, by a spent ball, which struck the outer and anterior aspect of the middle third of the right thigh, producing a severe comminuted fracture of the femur, with extensive laceration of the soft parts. The thigh was protected temporarily by a

single straight splint on the outside. On the following morning the limb was put on a M'Intyre's splint, with two side splints in addition; considerable inflammation followed, with great swelling and profuse discharge, and constitutional disturbance. He remained in bed until May 6th, when he embarked for Bombay, when the wound was still discharging a good deal.

Four large and several smaller pieces of bone have come away at different times; abscesses have frequently formed on the posterior aspect of the thigh; and on one occasion a large piece of bone was removed from it.

Fort Pitt, May 4, 1858. General health good; fracture firmly united, but the bone is curved outwards; the original wound has never entirely closed, and there are now two sinuses leading down to bare bone.

18th. The necrosed portion of bone, about one inch in length, was removed; the limb was two and a quarter inches shorter than its fellow; on standing up, the great toe and next one touched the ground, and the heel is raised three and a quarter inches.

29th. Wounds nearly healed; can bear his weight upon the limb, and walk about, with the aid of a stick, without crutches. On the whole, he has a very useful limb, much preferable to any artificial one.

30th. Invalided.

In the next case there was a double fracture, both firmly united, the ball still remaining in; the limb is two and a half inches shortened; still, he walks so well that he has been sent to modified duty.

64th Regt.—Private Patrick Carty, aged 28, wounded at Lucknow by a musket-ball, which struck him, while in the erect position, on the right thigh, on its posterior surface, about five inches below the superior spinous process of the ilium; the ball, it is stated, still remains in the thigh. After being wounded, he remained at the village of Amoo for three days, with his thigh bound up tightly (he states) with short splints placed round the limb; on the fourth day he was removed to hospital at Cawnpore. Eighteen days after the wound was inflicted, he had a long splint put on, and was placed on a hard mattress; he remained in hospital at Cawnpore twenty-four days, and was then carried to Allahabad, the journey occupying eight days; he remained in hospital at Allahabad for one month, and was then conveyed to Calcutta in a steam-vessel; he remained in hospital at Calcutta for two months and eight days; the splint was removed after he had been in hospital at Calcutta one month; and on his embarking for England, on January 8, 1858,

he was able to move about tolerably well with the aid of crutches; he states that during the voyage home he gained strength in the limb very rapidly.

June 25, 1858. The femur appears to have been fractured in two places: the upper fracture is just below the spot where the ball entered, a projection of a fractured end of the bone is distinctly felt there, and another projection of a fractured end of bone is felt at the outer and middle part of the thigh; there is also a small tumour on the outer side of the thigh, below the strong fascia, which is only movable when the muscles are relaxed: this may, probably, be the ball; the limb is shortened to the extent of two and a half inches; he can now walk for a short distance with very little lameness, without crutches or stick, and states that he does not suffer any pain unless he gets on uneven ground; his general health is good.

September 6, 1858. Sent to modified duty.

December 22nd. Invalided.

In the two following cases the fracture was in the upper third; the broken limbs were one and a half inches shortened, and they had become nearly as strong as the other legs.

53rd Regt.—Private John Ashworth, aged 29, wounded November 1, 1857, by a musket-ball, which entered two inches below the great trochanter, and emerged in the front of the thigh at its upper third, having in its course fractured the bone; the limb is one and a half inches shorter than the other.

July 14, 1858. Wounds healed; complains of weakness in the limb, but is able to walk about without the assistance of a stick.

September 6th. Sent to modified duty.

52nd Regt,—Private Joseph Hewitt, aged 27, wounded July 12th, at Goodispore, by a musket-ball, which entered on the anterior aspect of the upper third of the left thigh, and fractured the femur, the ball was cut out in the lower part of the gluteus muscles six weeks after.

July 20, 1858. Wound healed; the fractured ends of the bones overlap; the leg is now an inch and a half shorter than the other, and he cannot put his heel to the ground. It is a good cure, and he still retains a very useful limb; no pieces of bone came away; long splint used.

22nd. Invalided.

The following is a case of fracture of the upper third; the ends of the bones overlap considerably; the limb is shortened two and a half inches, and the ball lodged.

75th Regt.—Private Edward Collins, wounded at Delhi, June 8, 1857, by a musket-ball, which entered the upper and

outer side of the right thigh, and lodged, fracturing the femur; ball extracted; a piece of bone came away.

July 20th. Wound healed; right leg about two and a half inches shorter than left; femur bent; fractured ends of bone overlap, and there is abundant deposition of new bone; the long splint was used. Has a good useful limb, and can walk a long distance.

September 6, 1858. Sent to modified duty.

October 6th, 1858. Invalided by an order from the Horse Guards.

In the next case the fracture is between the middle and lower thirds of the femur; limb shortened one and a half inches.

53rd Regt.—Private James Burke, wounded at Lucknow, November 16, 1857, by a musket-ball, which entered the front of the left thigh, about the junction of the lower with the middle third, fracturing the femur, and passing inwards and backwards; it was cut out two days after in the inner side of the thigh; no piece of bone came away. Was sent back to Cawnpore in a dooley, and his leg retained in the long splint; went from Cawnpore, in a hackney, to Allahabad, on the 2nd December, and arrived there on the 10th, and shortly after the limb was put on a double-inclined plane, and finally upon the long splint; was unable to bear his weight on the limb until April, 1858.

August 16, 1858. Wounds healed; the fracture is united, but the ends overlap on the outer side, and the left leg is about one and a half inches shorter than the right; he can bend the knee-joint, and has a very useful limb, being able to walk tolerably well.

September 6, 1858. Sent to modified duty.

The following fatal case shows that it is often impossible to find out by what description of missile the wound is produced, as the document stated that the fracture was caused by a portion of shell, and a ball is seen to be lodged between the united ends of the bones. It also appears that there were two apertures, one of entrance and one of exit; so that he must have been wounded by two projectiles,—one, the ball, lodged; and the other, probably a portion of shell, perforated the limb. The preparation also shows the state of the parts twelve months after the injury. In such a case as this, excision at the hip might have been advisable.

60th Rifles (1st Battalion).—Sergeant Hugh Walmsley, aged 30, was taken into hospital at Gravesend from on board ship, being unable to proceed to Fort Pitt with the remainder

of the invalids from India. Was wounded July 4, 1857, at Delhi, by a musket-ball, the ball entering about the upper third of the left thigh upon the outer side, and making its way out or through on the inner side, shattering the bone, some fragments of which have come away since he had been on board ship; on his arrival the wound was still open and discharging profusely; dead bone was easily detected by introducing the probe; was emaciated in the extreme, and suffering from chronic diarrhœa of a very obstinate character; the diarrhœa continued after his landing, and was eventually the cause of his death.

Post-mortem.—Body.—The marks of entrance and exit of a musket-ball on the inner and outer side of the upper third of right thigh; the limb was much shortened and distorted to the extent of about three inches, the great toe resting upon the instep of the opposite side. *Thorax.*—Heart and lungs both healthy. *Abdomen.*—Liver healthy, with the exception of one or two whitened patches on its surface; the lower portion of the large intestines was congested, and the mucous membrane showed marks of old ulceration, the result of chronic dysentery. Preparation No. 3624. Right femur, showing a comminuted fracture of the upper third, immediately below the trochanter; the fracture extends from the great trochanter obliquely, downwards and inwards, for an inch below the smaller trochanter; the extremity of the lower end of the fractured bone is on a level with the great trochanter; the extremities of the fractured ends of the bones are very firmly united by extensive depositions of new bone, and there is a large cavity between the ends, in which there is a round musket-ball, and a large aperture leading to it on the outer side, where it entered; on this side there is also a large irregular lamina of necrosed bone.

The last is a case of fracture between the middle and lower thirds, followed by necrosis, and extensive deposition of new bone so as in some measure to impede the motion of the knee-joint.

93rd Regt.—Private Samuel Hunter, aged 24, wounded at Lucknow, November 1, 1857, by a musket-ball, which struck the outer side of the left thigh, at the juncture of the middle and lower third, fracturing the femur, and passed out on the inner side; a number of pieces of necrosed bone have come away. Was sent in a dooley to Futtehpore, where he remained nine days; the limb being placed in a short splint along both sides; was then sent by dooley to Allahabad, where the long splint was applied, and retained four months.

September 26, 1858. Aperture of entrance and exit healed;

there is a sinus on the outer and posterior aspect of the middle and lower third of the thigh, through one of which bone can be detected; the left leg is one inch shorter than the other, and there is great deposition of callus around the fractured ends of the bone, which have been considerably displaced.

September 5, 1858. Invalided.

The three following preparations, Nos. 2936, 2937, 2938, where the patient survived for many months, show the great amount of comminution which takes place, even from the old ball, and the amount of distortion which unavoidably ensues from the impossibility of keeping up the requisite degree of extension, with the consequent necrosis of portions of bone, and the large quantity of callus which is thrown out. No. 2936 shows that the inflammation must have extended to the knee-joint, the patella having become anchylosed to the femur, with absorption of the cartilages. In No. 2937 there are several large portions of bone, dead, and in process of separation. No. 2938 shows an immense large comminuted portion lying behind, with very great displacement and shortening, with very profuse depositions of new osseous matter.

The preparations Nos. 2936 and 2938 were from patients who were wounded at Ferozeshah.

No. 2936. Comminuted fracture at the middle and lower third of the left femur, from gunshot. The bone is much distorted, and the lower portion is turned inwards; there is a large fragment lying in the posterior aspect, and the fractured extremities are united by a very abundant deposition of new osseous matter, in the centre of which are two portions of necrosed bone, firmly attached to the new bony matter. The patella is anchylosed to the femur, and the cartilage on the latter is absorbed. The patient died twelve months after the accident, from pyemia. Taken from Private James Hewitt, 29th Regiment, aged 25; seven years' service, of which four years in India; received a gunshot wound at Ferozepore, December 21, 1845; the ball passed through the left thigh, fracturing the femur, and lodged in the right, from which it was extracted. Admitted into Fort Pitt General Hospital, September 28, 1846. There were two depressions on the left thigh. On October 7th erysipelas attacked this thigh; on the 11th, incisions were made on its inner side, from which a piece of exfoliated bone was extracted.

From this date to the beginning of November the erysipelas had gradually extended to the foot, and had given rise to great constitutional disturbance. Openings were at different times made to give exit to large quantities of pus. There was

shortening of the limb to the extent of four and a half inches, and four openings in the thigh, one on the outer side, through which the probe reached the bone in a denuded state.

December 27th. He was attacked with acute pain in the left side, at the lower border of the true ribs, accompanied by cough and difficulty of breathing. Expectoration not coloured; on the left side there was dulness, and coarse crepitation heard.

He gradually became weaker, and died January 2, 1847.

Sectio Cadaveris.—External Appearances.—Body much emaciated; left leg much swollen, and four and a half inches shorter than the other; on making an incision into the affected limb, the sub-cutaneous fat and areolar tissue were thickened, and infiltrated with serum; on laying open the outer sinus there issued a large quantity of dark-coloured pus; underneath this opening, and lying close upon the bone, was found the flattened remains of a musket-ball. The left pleural cavity contained two ounces of turbid serum, in which were floating flakes and masses of lymph; the pulmonary and costal pleura was highly vascular, and coated with a recent layer of lymph, which was easily detached. The lower lobe was condensed, and sank in water; a section presented the usual appearance of grey hepatization, softened and broke down, and infiltrated with pus. Right lung healthy.

No. 2937. Gunshot fracture of the left thigh. The ends of the bones are very much displaced, but united by new bony deposit, which forms a large cavity; the end of the lower portion of the femur is necrosed and in progress of being separated; there are also several other portions of necrosed bone, either partially separated or bound down by the new bone; a comminuted portion of bone is situated on the outside, attached to the others by bony union.

No. 2938. Lower part of the right femur, showing an extensive comminuted fracture from gunshot. The broken ends are much displaced; the lower portion lies to the inner side of the upper, having been drawn upwards and inwards by the action of the muscles; the limb must have been shortened to the extent of three or four inches; there is a large fragment at the posterior part of the preparation, which is united to the two fractured ends, but particularly to the lower portion, by a very abundant deposition of new osseous matter; there is a large cavity between the posterior fragment and the lower portion of the femur; the upper extremity of the fracture lies to the outer side of the lower, the extreme end of which is sharp and pointed, having been fractured obliquely, and, probably, protruded through the skin. From an officer who received com-

pound fracture of the thigh from gunshot, at Ferozeshah, and afterwards died of phthisis pulmonalis.

The preparation No. 2939 is a good specimen of ununited fracture at the middle of the femur, and shows the amount of comminution which follows from *two* conical balls, and also the deteriorated state of the patient's constitution, very little callus having been thrown out. The bone in this case is not nearly so extensively comminuted as in preparations Nos. 2936, 2937, and 2938, which were produced by the old round ball. This specimen is also an excellent example, showing the care which is requisite in examining gunshot wounds, either before inflammation has set in, or when operative measures have become necessary. In this case *two* minie balls had entered the limb; one of them was loosened by the suppurative process, and was extracted, and the other was found, on post-mortem examination, lying between the ends of the ununited fracture. The ball is also seen to be enclosed between the ends of the united fractures in the case of Walmesley, page 46. The same has been noticed in the Report on the Wounded from the Crimea, p. 362. No. 2939. Gun-shot fracture in the centre of the right femur; bone much comminuted, and the extremities ununited and overlapping. The comminuted pieces are united by new bony deposit, and there are also several portions necrosed. Taken from Peter M'Donald, 42nd Highlanders, who was wounded on the Alma by a musket-shot, and sent to Scutari, when he was much reduced in strength, and the limb very much swelled, and discharging freely. After some time a musket-ball was discovered and removed; the swelling reduced, the sinuses closed, and he was enabled to move about with crutches. About a week after, the limb again swelled, irritative fever ensued, and the man died. On examining the limb, another minie-ball was found in the cavity between the ends of the bones, chiefly covered by ligamentous and bony matter.

When a bone has sustained an injury so as to cause a slight superficial exfoliation, this is generally quickly thrown off, but when necrosis of half the circumference, or even of the whole thickness of the shaft of a long bone, takes place, inflammation and suppuration to a greater or less extent ensue, and new bone is thrown out, which encloses the dead or dying bone. During the time these fragments are being detached, the patients are more exposed to the absorption of pus, and consequently death from pyemia.

The following preparations, Nos. 2934 and 2935, and also that of Private Hunter, from India, are excellent examples of

necrosis following these injuries, especially No. 2934, where nearly the whole of the shaft of the bone is dead, and enclosed in a new osseous case. It appears to have been the result of a severe injury to the bone, but without producing a complete fracture.

No. 2934. Femur presenting necrosis of its shaft. The sequestrum comprehends the entire thickness and nearly the whole length of the shaft, and is very rough on the surface. It is detached, and surrounded by a thick uneven shell of new bone, abundantly pierced by cloacæ, so as to expose the dead part extensively. From a man admitted with a gunshot wound of two years' standing; the ball had lodged, but had been cut out a month afterwards. On admission there were two openings between the hamstrings; his general health was very bad, and he died after ten weeks' treatment.

No. 2935. Lower half of the femur, exhibiting necrosis of the anterior circumference of its shaft. The sequestrum is rough on the surface, and loosely contained in a cavity, formed by an abundant deposit of new bone, which is pierced by numerous foramina. From a gunshot injury.

The preparation, No. 2941, shows a gunshot fracture of the lower third of the femur, which is fractured obliquely, and comminuted; a portion is driven into the medullary canal. The margin of both fragments shows the action of the absorbents; there is a line marking the portion of bone in process of separation, and partly necrosed along the margin of the fracture. Secondary amputation was performed at the upper third.

The preparation No. 2931 is an example of a round leaden bullet, producing an oblique fracture through the great trochanter, and becoming firmly imbedded in the cancellous structure of this tuberosity.

An illustration of a grape-shot lodging in bone without splintering, or even causing a fissure, is No. 2932, where there is a cavity at the base of the great trochanter, containing a grape-shot which is quite loose, the cavity being considerably larger than the ball.

Fracture of the Tibia only.

Gunshot fractures of the leg are frequently of such a severe character as to require immediate amputation, especially if produced by round-shot or shell. Those caused by musket-ball seldom call for the removal of the limb. In the leg, all the detached fragments of broken bone being so near the surface, are easily removed, and irregular portions from both ends of

the fractured bone are generally taken away by the saw, if necessary.

When one bone only is fractured, the sound one retains the other in its place, and makes the case much less serious. When the tibia is fractured high up, and the knee-joint has been injured, it will be a case for amputation, as it is only on very rare occasions that the limb can be saved. When the fracture takes place near the ankle, and a fissure extends into the joint, it is rarely that the patient recovers. This, however, took place in Patrick Burrowes, 5th Regt., under partial fracture.

Under this head 6 have been admitted, of whom 1 has been sent to modified duty, and 5 invalided. Only 1 was produced by grape, and the remainder by musket-ball; 3 were still unhealed. They were all very severe compound comminuted fractures of this bone, and, with the exception of one, all were followed by necrosis to a greater or less extent; 3 occurred in the upper third of the bone, and 3 in the lower, one of which was so close to the ankle-joint that partial anchylosis resulted. One man, of the Royal Artillery, died at Gravesend, but his name is not included in this return, although I take the opportunity of giving the details of the case.

The following is a case of extensive necrosis of the tibia:—

64th Regt.—Private Edwin Beardsall, wounded July 16, 1857, at Cawnpore, by a grape-shot on the right leg, about three inches above the ankle-joint. There was only a slight wound of the skin, but there was a comminuted fracture of the tibia; since then several very large pieces of necrosed bone have come away.

April, 1858. There is now a large deep hollow on the anterior and inner side of the tibia, with two sinuses leading inwards, but no bone could be detected in this direction. There is a third sinus on the inner side of the tibia, where bare bone can be felt. He cannot bear much weight upon the limb, and the ankle-joint is stiff for want of use.

December 22, 1858. Unfit for service; invalided.

The next case is a fracture of tibia, followed by anchylosis of the ankle-joint.

60th Rifles (1st Battalion).—John Flynn, aged 21, wounded at Delhi, June 19, 1857, by a musket-ball, which entered the inner side of the left tibia, two inches above the ankle-joint, and probably passed out at the external malleolus. Several pieces of bone came away from the entrance wound.

July 20th. Wound healed, skin adherent to tibia, ankle-joint partially anchylosed.

The following fatal case is an example of an extensive comminuted fracture which had united, but the bone became diseased:—Royal Artillery.—Gunner John Abberley. This man was admitted into hospital at Gravesend, being unable to proceed to Chatham with the remainder of the men. He was wounded by a musket-ball at Lucknow, the ball striking the upper third of the bone, under the attachment of the ligamentum patellæ, and carrying away a large portion of the bone. When taken on board ship, the wound was said to be about the size of a five-shilling piece, with the bone exposed in the centre, but looking healthy. Gangrene made its appearance about three weeks after sailing. When disembarked, the whole of the soft parts of the anterior surface of the leg, between the wounded part and the ankle was one large slough, coming away with the applications. The whole bone was exposed, the soft part on each side sloughy, blackened, and that offensive smell peculiar to the disease was present. Was emaciated in the extreme, and only kept up by the administration of stimulants to the hour of his death, which took place July 3, 1858.

Post-mortem.—Body.—Much emaciated. *Thorax.*—Old pleuritic adhesions between costal pleura and left lung; both lungs healthy and crepitant; heart and pericardium healthy. *Abdomen.*—Liver healthy; stomach and intestines healthy, as also the remaining viscera. No. 3628. Right tibia, showing a compound comminuted fracture at its upper third, two inches below the tubercle; the fractured ends have become re-united by very abundant depositions of new bone, especially on the posterior surface. In front there is a deep carious cavity, about two inches in diameter, and the same extent in depth. There is one large splinter on the inner side, which has become perfectly united to both ends of the tibia. In the recent state the whole of the anterior surface of the tibia was exposed, and in most part denuded of periosteum.

No. 2947 is an example of a gunshot fracture of the head of the tibia by a musket-ball, making its exit on the inner side of the leg, fracturing and comminuting the bone, but not injuring the joint. The fractured portions have re-united, there is a very abundant deposition of new bone around them, and there is a large cavity in the centre, which is in an ulcerated state. Taken from Private Henry Farrer, aged 32, 34th Regt., an Englishman, by trade a moulder. Total service, fourteen and a half years, chiefly at home, and in the Mediterra-

nean. Always enjoyed good health, and when admitted was a strong-looking man. He was wounded on June 7, 1855, by a musket-ball striking the head of the left tibia, making its exit on the inner side of the leg, fracturing and comminuting the bone, but not injuring the joint. Since then he has always been in hospital. Considerable quantities of bone have come away, but without any severe pain or loss of health. On admission three openings existed, through each of which part of a large sequestrum could be felt with a probe. December 13, 1858.—Died, nearly six months after the receipt of the wound, from pyemia. *Post-mortem Examination.*—Weight of lungs, 3 lbs. 12 oz. *Abdomen.*—A portion of the convex surface of the liver adhered very firmly to the diaphragm by recently effused lymph. Corresponding to this position, on making a section of the liver, a large diffused abscess was found, which contained ten ounces of pus, which was infiltrated throughout this part of the structure of the liver, several bands of which stretched across the sac. There was no defined wall to the abscess, which appeared to have resulted from the coalescing of several minute abscesses. The sac, on being opened, allowed a large quantity of very fetid gas to escape (sulphuretted hydrogen). There was a second abscess situated to the right of the other, and of nearly the same size. The rest of the structure of the liver was soft and friable, and easily broken up. Weight of liver, 5 lbs. 3 oz.

After a minute and careful examination, and tracing the veins of the left leg through the abdomen, no sign of inflammation could be detected. It is, nevertheless, the opinion of some pathologists, that in the great majority of cases some trace of inflammation in the veins may be found, and when they cannot, the veins affected are supposed to be so small or so obscure that they are overlooked. Further, that pus globules have been detected in the blood of the pyemic, and even in the blood of animals which have died from the effects of pus injected into the veins. The globules of pus have only once been discovered, so that pus globules seem in a great majority of cases to be rapidly destroyed after entering the circulation. This throws considerable doubt on the view that the pus globules become arrested in the capillaries in consequence of their size, and thus establish numerous foci of inflammation. Rokitansky also expresses his opinion very strongly against it. He considers that pyemia occurs not uncommonly as a primitive affection, that is to say, that pus is actually formed in the blood itself in consequence of certain changes of a chemico-vital nature. This is well seen in globular vegetations in the

heart. This supposition accounts for cases occasionally occurring in which there are multiple abscesses, yet no source of purulent infection can be discovered.—*Donor, Dr. Williamson, Staff-Surgeon.*

No. 2946 shows the tibia much enlarged, and presenting a cavity in its substance, from which a sequestrum has been detached, with several cloacæ. From a case of gunshot injury.

The preparation, No. 2949, shows a gunshot fracture of the upper third of the tibia. The bone was comminuted, and the fracture united, but with some displacement. A portion of the crest of the bone appears to have been on the point of being necrosed. The external margin of the centre of the fibula is carious.

Fracture of the Fibula only.

4 fractures of the fibula were admitted, of which 3 have been sent to duty, and 1 invalided. 1 only was caused by grape-shot, and 3 by musket-ball. All were healed on arrival.

Fracture of the Tibia and Fibula.

2 have been admitted, and been invalided. 1 was by a musket-ball, followed by sloughing and necrosis. The other was by a grape-shot at the lower third of the leg, followed by anchylosis of the ankle-joint.

75th Regt.—Private Thomas Dabney, aged 38, wounded at Delhi, June 8, 1857, by a grape-shot which struck him on the inner and posterior aspect of the tibia, one inch above the right ankle, and passed out through the external malleolus. Several pieces of bone have come away.

July 20th. Wound healed. Skin adherent to bone, and parts much thickened. Ankle-joint anchylosed. Considerable loss of bone of both tibia and fibula.

November 11, 1858. Invalided.

Preparation No. 2950 is a good example of fracture of both tibia and fibula at the upper third from gunshot. The fractured ends are united by a very abundant deposition of osseous matter, more particularly the tibia, in which there are several cloacæ leading into a cavity in the centre of the bone, where there were some portions necrosed. The fibula has been fractured obliquely; the superior lies to the outer side, and overlaps the lower portion to the extent of an inch, and the latter is united to the tibia by a quantity of new bone. New osseous matter is also deposited to a considerable extent on the surface of the tibia and fibula. On the anterior surface of

the tibia, immediately above the fracture, absorption of the new bony matter seems to have been going on.

Necrosis of portions of the shaft of the tibia frequently follows gunshot wounds of the leg,—more rarely of the whole thickness or length of the bone,—leaving sinuses discharging pus for months or years, and rendering the patient liable to death from pyemia, as in the case of No. 2947, Private Farrer.

No. 2946. Tibia much thickened, and presenting a cavity in its surface, from which a sequestrum has been detached with several cloacæ. From a gunshot injury.

The case of Beardsall is also a good example of a case of loss of a great portion of this bone by necrosis.

Division 5.—*Penetrating, perforating, or lacerating the several Structures of the Tarsus and Metatarsus.*

13 were admitted under this head, of whom 4 have been sent to duty, 2 to modified duty, 5 invalided, and 2 remain. 11 were produced by musket-ball, and 1 by round-shot; only one remained unhealed. Two went through the calcaneum; one across the fleshy part of the sole of the foot; two through the tarsus only. The one by round-shot bruised the bones, but did not break the skin, and caused severe injuries to both the tarsus and metatarsus. In those cases that were invalided the bones had been fractured, and tendons and ligaments lacerated, so as to produce in some cases considerable contraction and loss of power in the foot.

The following is an example of this injury:—

24th Regt.—Private Wm. Alexander, aged 21, wounded at Jehlum, July 7, 1857, by a musket-ball, which struck the outer side of the right calcaneum, passed through this bone, and made its exit on the inner side. On September 26, 1857, an incision was made on the posterior part of the os calcis, and necrosed portions of bone were removed, saving the attachment of the tendo Achillis.

August 2, 1858. Wounds healed, but cannot bear his weight on the heel.

August 3, 1858. Invalided.

Class V.—Gunshot Wounds, with direct penetration or perforation of the larger Joints.

This class is restricted to those cases where there is undoubted evidence of the joint having been directly penetrated. For instance, cases of partial or complete fracture of a bone close to a joint are either placed in Class IX., Division 2, or

in Class IX., Division 4, according as the case may be. These cases, although generally very severe, and followed by acute inflammation and suppuration, ending in anchylosis (as in the case of Farraher), are not of such a dangerous nature as when the ball has passed directly through the joint, fracturing the bone, as in those included under the present head.

Admitted from India:—Wounds of larger joints, with fracture of bones, 8; ditto without fracture, 1. Total, 9.

Of these, 6 have been invalided, and 3 remain undisposed of. 1 occurred in the shoulder-joint, 4 in the elbow, 1 in the carpus, two in the knee, and 1 in the ankle. 8 were caused by musket-ball, and 1 by a pistol-bullet. Except 2, all were healed.

In addition to these wounds of the larger joints, there are 3 cases of excision, viz.:—2 of the elbow and 1 of the shoulder-joint, which will be detailed under that head.

In the Crimean War 121 cases occurred amongst the men, of whom 25 died without any operative interference, and 10 among the officers, of which 4 were treated without operation; and of this number, 3 terminated unfavourably[a].

Shoulder-Joint.—Only one case is returned under this head as having arrived from India, and the history of the case is detailed under the class Resections, this operation having been performed at Fort Pitt. In several cases inflammation had taken place contiguous to the injury, resulting in thickening and contraction of the muscular and ligamentous structures, and in some cases the joint had become completely anchylosed, as in Private J. Day, 32nd Regt., under the head of Amputation of the Arm.

The preparations Nos. 2921 and 2922 show the starred fracture and fissures resulting from gunshot injury of the head of the humerus.

"Of 17 gunshot injuries of the shoulder-joint amongst the Crimean wounded, 2 were fatal in the primary hospitals without operation, the cases having apparently been complicated with some injury to the contents of the chest. One patient died in the secondary hospital at Balaklava, of idiopathic fever, contracted while under treatment for the wound, while the whole number of the remaining cases, viz., 14, required operative interference."

Elbow-Joint.—Four cases were admitted from India. All have been invalided.

In these elbow-joint cases, there can be no doubt of the

[a] *Vide* Report on the Crimean Wounded, p. 350.

direct penetration of the joint, with comminution of bone, resulting in anchylosis. In three of them the ulnar nerve was injured. In these instances the olecranon was fractured, and in one case the external condyle; the joint was anchylosed in all of them. In three of them the forearm was at an obtuse angle. In the fourth case the arm was quite straight, and the elbow-joint anchylosed, rendering the arm very useless; but in this case the humerus had also been fractured, making it very difficult to treat. Even now the limb is much more useful than any artificial arm which he could have been supplied with.

In none of them had resection been performed, and it becomes a question whether these patients would have had a more useful arm had the joint been excised, so as to allow of free motion of the joint. If it were possible to induce patients to use the arm at an earlier period of the treatment, they might preserve some motion in the joint.

"Of 30 injuries in the elbow-joint among the men in the Crimean War, and 4 among the officers, 4 were fatal without operation. 2 of these were complicated, with injury of the artery (1 of the brachial and 1 of the ulnar), and the fatal result seems to have been mainly due to the continued effects of shock and loss of blood."

In the two following cases from India, the joint is anchylosed, and the arm in a bent position.

32nd Regt.—Private Harry Arthurs, aged 33, wounded September 27, 1857, at Lucknow, in the left elbow. The musket-ball entered over the external condyle, and passed out on the inner side of the olecranon opening into the joint; severe inflammation and suppuration followed. The arm is now in a bent position, and the elbow-joint is anchylosed. He has lost the power over the fingers, and has no feeling in half of the ring finger and little finger.

June 22, 1858. Invalided.

78th Regt.—Private Wm. Wardleworth, aged 34, wounded at Lucknow, September 25, 1858, by a musket-ball in the right elbow-joint. It entered over the olecranon, and was cut out at the same place the following day; abscesses formed around the joint. 2nd. By a musket-ball on the inner side of the left knee; a flesh wound.

July 13th. The wounds are all healed, and the elbow-joint anchylosed. There is one large cicatrix on the inner side, adherent.

August 5, 1858. Invalided.

In the next case the joint was anchylosed, and there was also an injury of the ulnar nerve.

52nd Regt.—Private James Marshall, aged 27, wounded at Delhi, Sept. 14, 1857, by a pistol-ball, which passed through the elbow-joint. It entered close to the outer side of the olecranon process, and between it and the external condyle, and passed through the olecranon, and made its exit on the inner side of this process, close to the ulnar nerve. There was a discharge of synovia from the wound for some days.

July 20th. Wound healed; elbow-joint bent and anchylosed. Has lost the sensation of the little and one-half of ring fingers.

July 22, 1858. Invalided.

The following is a case of wound of the joint, complicated with fracture of the shaft of the humerus. Elbow-joint anchylosed, and the arm in a straight position.

61st Regt.—Private M. Dunne, aged 38, wounded at Delhi, July 9, 1857, by a musket-ball, which entered through the centre of the right deltoid muscle, and passed downwards, fracturing the humerus about its centre, and made its exit at the elbow-joint, where it also appears to have wounded the joint and fractured the olecranon process of the ulna. The arm was placed upon a straight splint. Both apertures of entrance and exit soon healed, but considerable inflammation of the arm and elbow-joint ensued, which was relieved by free incisions.

Sept. 5, 1858. Wounds made by musket-ball healed. There are two sinuses on the outer aspect of the arm, about its centre, leading down to necrosed bone. The fracture at this point is united; the forearm is in a straight position, and the elbow-joint anchylosed. The arm is about $1\frac{1}{2}$ inches shorter than the other.

Jan. 13, 1859. Invalided.

Hip-Joint.—No case of wound of this joint arrived from India. There is a preparation in the Museum, No. 2930, where the old ball is firmly lodged in the head of the femur, having produced only a fissure. This would have been a favourable case for resection. The following is a description of it:—

No. 2930.—A matchlock-ball, firmly lodged in the head of the femur. The ball entered opposite to the trochanter major, and passed through the brim of the acetabulum. From Private Alexander M'Phail, aged 33, wounded at Dubha, March 24, 1843, by a matchlock-ball, which entered a little above the great trochanter of the right limb anteriorly, and was lost. The leg became powerless. On coming to Colaba, on April 28, he did not complain of much pain, except when the joint was

moved. Slight fulness over the hip was the only symptom of injury. Leeches and counter-irritation were employed, and he seemed to get better. On May 6th he was attacked with trismus, and died on the 9th.

The ball was found imbedded in the head of the femur, which, with half of the brim of the acetabulum, was shattered, and the capsular ligament formed the sac of an abscess, which contained a considerable quantity of pus and spiculæ of bone. The orifice of the wound, it is added, had closed some time previous to his death.

10 cases of wounds of the hip-joint are returned in the Report on Crimean Wounded. In 3 there had been such extensive injury inflicted that they proved fatal in a few hours. 7 were discharged for operation, 1 of which was for amputation at the hip-joint, in a case of extensive longitudinal fracture into the joint; the remaining 6 for resection of the head of the bone.

Excision of the hip-joint for gunshot injury has been performed eleven times. Of these, but one recovered, that of a soldier wounded by a shell at Sebastopol, and operated upon by Dr. O'Leary. The patient was 25 years of age; the head, neck, and trochanter of the femur were removed.

Of the 11 cases recorded, 6 occurred in the Crimean War. 1 occurred in the Schleswig Holstein War; 1 by Dr. Ross, 1 by Oppenheim, 1 by M. Seutin, and 1 by Schwartz. In the Crimean war, excision of the head of the femur was performed six times, and all but one were primary operations. One of the patients survived the operation, and recovered, viz., Private Thomas M'Kenna, 68th Regt. On his arrival at Chatham, the limb is reported to have been about $2\frac{1}{2}$ inches shorter than the other, and capable of bearing some considerable portion of the weight of the body. He could swing it and advance it, but the knee could not be bent. Rotation was admitted to a very limited extent, but performed with considerable pain. The wound was soundly healed, and the man was discharged from the service.

So far as the results of the Crimean war go, it clearly proves the superiority of excision of the head of the femur over amputation at the hip-joint.

The head of the femur has frequently been excised for morbus coxæ, and with great success, but no comparison can be made between it and that for gunshot wounds. No doubt in any future campaign, excision of the hip-joint will be much more frequently employed, and great attention paid to the selection of cases.

Knee-Joint.—2 were admitted from India. 1 was invalided, and the other remains.

In one case the synovial membrane was directly perforated, but no fracture of bone had taken place. In the other it is doubtful if the ball penetrated the cavity of the joint, although the surgeon says it passed through the joint.

In the Crimean war, 23 cases are returned among the men, and 6 in officers. 6 of these patients died, viz., 3 men and 3 officers. 13 men and 2 officers were discharged for operation, but one only of those for resection of the joint, and in that case the operation was a secondary one, an attempt having been made in the first instance to save the limb. In the remainder amputation was resorted to.

In the following case from India, the ball seems to have passed through the condyles of the femur, and was followed by partial anchylosis.

Private John Dunlay, aged 26, wounded at Lucknow, November 16, 1857, by a musket-ball, which struck him on the inner side of the right knee, two inches from the side of the patella, passed through the condyle of the femur and knee-joint, and passed out on the outside of the joint, close to the head of the fibula.

July 13th. Wounds healed, knee-joint slightly bent, and partially anchylosed. Can walk tolerably well, and has a very useful limb; neither cicatrix adherent to the bone.

In the next case it is rather doubtful whether there was direct penetration of the joint.

93rd Regt.—Sergt. David Simm, wounded at Royah, on April 15, 1858, by a bullet which entered 1½ inches to the inner side of the patella, over the inner condyle of the femur, and made its exit at a little higher level, over the tendon of the inner hamstring. It is doubtful if it entered the cavity of the joint, although the surgeon says, "passed through the joint." It was followed by acute inflammation of the joint, and the limb cannot now be fully straightened, and on flexing it a grating sensation is felt.

The following case, although not included in the Return as a wound of the joint, is interesting as showing the inflammation extending to the structures of the joint, terminating in anchylosis.

61st Regt.—Private Martin Farraher, wounded August 25, 1857, by a musket-ball, which entered the external condyle of the left knee-joint, making its exit through the outer side of the popliteal space. Considerable inflammation and swelling of the joint ensued.

Sept. 5th. The joint itself does not appear to have been wounded, but from its proximity, severe inflammation followed, resulting in complete anchylosis. There are livid spots on his leg, from his constitution being tainted with scurvy, and his gums are spongy.

As yet our experience of excision of the knee-joint in cases of gunshot fractures is not extensive, and the means necessary for after-treatment in military practice are not encouraging, but the success which has followed it in cases of disease of the joint makes military surgeons also wish to extend it to the field. The absolute rest and quiet after the operation which are so difficult to obtain with an army in the field is the chief and the only objection to its adoption.

There are 2 cases recorded of excision of this joint for gunshot injuries—1 in the Schleswig Holstein war, and the other in the Crimean war. Both died.

The following preparation, No. 2933, shows the condyles of the femur and the patella fractured by a carbine-ball, which in its entrance has comminuted the point of the patella, split the bone longitudinally, and lodged in the bone between the condyles, and caused a fissure through the internal one. From Private M. Walsh, 3rd Light Dragoons. The injury took place while the leg was in a state of flexion, from the accidental discharge of his comrade's carbine. The limb was amputated twenty-four hours after, and the man arrived at Fort Pitt quite well at the end of three months. The two following preparations, Nos. 2943 and 2944, are very interesting, as showing a perforating gunshot wound through the knee-joint. The ball entered the back part of the joint, and passed directly forwards, and shattered the patella in its exit, followed by recovery and anchylosis. Twenty-six months after the injury the man died at Fort Pitt, of an enormous abscess of the liver, the result of previous service in India. No. 2943. Section of a knee-joint, the bones of which are completely anchylosed, and the capsule obliterated. Dense cellular tissue occupies the interspaces of the articular surfaces. No. 2944. Section of preceding knee-joint, in which the soft parts have been removed, showing the cancelli of the femur and tibia, and also of the patella, completely continuous. The patella was irregularly fractured, and the fragments are now consolidated by osseous matter, and united to the femur. From Private Edw. Marr, aged 35. 20th Regt.—Was sent home from India in consequence of a gunshot wound of the left knee-joint, received on Oct. 21, 1833. Admitted into Fort Pitt, May 10, 1835. Left knee-joint was anchylosed; there was a cicatrix between the

vastus externus and triceps, and another immediately above the superior border of the patella. Muscles of the limb much attenuated. General health very indifferent, being under treatment for disease of the liver, of which he died on May 20, 1835.

On post-mortem examination there was found a large abscess in the right lobe of the liver, which communicated through the diaphragm with the base of the right lung. The sac of the abscess contained six pints of thick pus. The spleen was very much enlarged and softened. The peritoneal cavity contained two pints of turbid serum, with flakes of lymph floating in it.

The following preparation of a severe comminuted fracture of the head of the tibia is interesting as showing the discovery of a second fracture of the tibia, not compound, however, and situated about the middle of the bone. The skin over it showed not the least trace of injury from the fracture. How the fracture was produced is a matter for conjecture. If excision of the joint had been contemplated, this after discovery would have been, at the least, embarrassing.

No. 2948. Compound comminuted fracture of the head of the left tibia, caused by a shell. There is a second fracture situated about the middle of the bone. From Private James Aitkin, aged 27, who received a severe shell wound of the left leg in the trenches on August 18, 1855. He was standing erect at the time. The knee-joint was distinctly opened into, and the head of the tibia severely comminuted. Amputation was immediately performed, and the patient recovered.—*Donor, Dr. Cowan, Assistant Surgeon, 55th Regt.*

The following preparation shows a bayonet wound of the knee-joint, followed by severe inflammation, profuse purulent discharge, and irritative fever, rendering amputation necessary sixty days after the injury.

No. 3633. A portion of quill passed through the original wound shows the direction it took; it is situated just beneath the level of the patella, and a little to the right side. The synovial membrane is thick and gelatinous.

West York Rifle Regt.—Private John Gannell, of strong, healthy aspect, while drinking in a public-house, on February 5, 1858, a sergeant of another regiment drew his bayonet and wounded him on the left knee. The wound had every appearance of having pentrated the joint; the pus was excessive; the wound, though small, was deep, and situated just beneath the level of the patella, and a little to the right side of it. Late in the evening of the 5th he was delirious, and in great agony; the

pulse alternately full and bounding, and rapid and depressed: his sufferings were so great that anodynes had to be largely given before anything like a quiet state could be arrived at; the knee became swollen, and the pain continued, and showed signs of the formation of pus in the joint; abscesses also formed outside the joint, and were opened. A profuse discharge of purulent matter continued from the wound, and the man's appearance, pulse, &c., assumed the hectic character rendering amputation of the limb necessary, which was performed April 6, 1858, and the patient recovered.

Ankle-Joint.—The following case was the only admission from India under this head:—

37th Regt.—Private Charles Smith, wounded April 17, 1858, near Azinghar, by a musket-ball, which entered the left instep in front, and above the internal malleolus, and was cut out about two and a half inches lower down, and a little posteriorly. The inner malleolus appears to have been removed subsequently in fragments; anchylosis of the ankle-joint has followed; the foot turns slightly inwards, and the great toe is stiff. Invalided February 9, 1859.

Division 11[a].—*Gunshot Injury of the larger Arteries, not being at the same time cases of Compound Fracture.*

Under this head none were admitted from India. It is, however, probable that the case of Private Bulger, which is detailed at page 38, is of this nature.

It is seldom that primary hemorrhage occurs on the field of battle, even though the ball may have passed directly through the course of a large artery. This is in some measure accounted for, although not entirely, by the round form and the strong elastic coats, but especially by the mobility of the vessel.

Arteries and veins firmly bound to bone are more likely to be injured than those that are lying loose in the fleshy parts of a limb: for instance, the femoral on the brim of the pelvis.

The coats of the veins being thinner than the artery, are much more readily injured, and primary hemorrhage proceeds more frequently from them than from the arteries.

Only 14 such are returned amongst the men during the whole period of the Crimean war, and one in an officer.

The following preparation is a beautiful example of the

[a] This class was left out in the Return of the Wounded from India, in consequence of none having been admitted; but it is inserted here, and thus alters the numbering of the succeeding classes.

elasticity and toughness of the coats of both artery and vein, and likewise of the mobility of these vessels, allowing of being pushed aside by the ball.

No. 408. Portion of the femoral artery and vein, between which a ball has passed, causing mortification of the limb, and death.—*Donor, J. Guthrie, Esq., D. I. G.* This specimen was taken from Private P. Tumbrill, of the Grenadiers of the 74th Regiment, of good stature, who was wounded on April 10, 1814, by a musket-ball, passing from the inside to the outside of the middle of the thigh; he says it bled considerably at first, but the bleeding soon ceased; the wound was not painful, and he thinks he observed the leg and foot to be colder than the rest of his body for the first two or three days, but did not much attend to it, further than conceiving the numbness, coldness, and impeded power of motion as natural to the wound.

"On the 18th April the gentleman in charge of this patient pointed him out to me as an extraordinary case of gangrene, coming on without, as he supposed, any sufficient cause. The wound on the outside of the thigh, or the exit of the ball, was nearly healed, and that on the inside was without inflammation or tumefaction, and with merely a little hardness to be felt on pressing. The pulsation of the artery could be distinctly felt to the edge of the wound; the leg was warm; the gangrene confined to the toes; the artery of the other thigh could be distinctly traced down to the tendon of the triceps. As he was at a small hospital about two miles from town, I did not see him again until the 20th, and afterwards on the 23rd, when, although the gangrenous portion included all the toes, it had the appearance of having ceased. Satisfied that it would again extend, I left directions with the assistant surgeon, that the limb should be amputated below the knee.

"The surgeon, whom I had not seen, and who did not understand the subject, disobeyed the order, conceiving there must be some mistake. On visiting the hospital a little after daylight on the 25th, I was greatly annoyed at finding the operation had not been done, and that the mortification had begun to spread the evening before. It was then too late; on the 26th it was above the ankle, with considerable swelling up to the knee; at night the man died, and the next morning at six o'clock I removed the femoral artery from Poupart's ligament to its passage through the triceps, which part was affected by the mortification.

"The ball had passed between the artery and vein in the spot where the vein is situated nearly behind it, and adherent only by cellular membrane, through which the ball made its

passage; the coats of the vein being little injured, and those of the artery not destroyed in substance, although bruised; it was at this spot much contracted in size, and filled above and below by coagula, which prevented the transmission of blood, and the vein above and below the wound was filled with coagulum, and was also impassable."

This preparation is unique. It is perhaps the only one in existence proving the elasticity which vessels possess, and their capability of avoiding to a certain extent an injury about to be inflicted on them.

Ligature of Arteries.—2 cases requiring ligature of arteries occurred: 1 was deligation of the radial artery, eleven days after a gunshot fracture of the ulna, implicating this artery; the other was for secondary hemorrhage, one month after a gunshot wound of the leg, with partial fracture of the tibia; the ligature was placed upon the lower third of the posterior tibial. In a third case it is stated that the brachial artery was tied, but there appears to be some doubt on the subject. The following is one of the cases:—

53rd Regt.—Private Patrick Hanafin, wounded at Lucknow, November 16, 1857, by a musket-ball, which entered on the inner side of the left tibia, about three inches above the ankle-joint, and passed through the fibula, three inches from its lower extremity; about one month after, secondary hemorrhage took place, following sloughing of the wound, requiring ligature of the posterior tibial at the lower third of the leg. He was also wounded in the right thigh by a musket-ball, which entered on the outside near its centre, and passed through in front of the femur, on the inner side, close to the course of the femoral artery.

Both wounds are healed.

Class 12.—Gunshot Wounds, with direct injury of the large Nerves, not being at the same time Cases of Compound Fracture.

6 cases have been admitted, 3 invalided, and 3 remain. All were wounds of the brachial plexus. In one there was complete paralysis of the arm, with a partial fracture of the scapula. In two the paralysis was only partial. In one case the arm hung powerless by the patient's side, without the slightest sensation or power of motion, and the temperature much diminished. In the other two cases the impaired condition of their arms, although not to such a great extent, was yet very nearly so. Various treatment was adopted,—blisters,

galvanism, friction, cold and salt-water baths, &c., without the slightest benefit.

Large nerves, like arteries, generally escape being wounded by musket-balls. When they are injured, paralysis of the limb, to a greater or less extent, comes on, along with numbness and wasting of the muscles of the extremity, as occurred in the following cases:—

Private Peter Clear, wounded at Cawnpore, November 28, 1857, by a musket-ball, which entered the posterior part of right shoulder, above the spine of the scapula, and caused a partial fracture of this bone, and passed directly forwards, and was cut out immediately above the centre of the right clavicle.

August 16, 1858. Wound healed. He has entirely lost the sense of feeling and of motion in this arm, which hangs quite powerless by his side. Temperature diminished, and the integuments are bedewed with a cold, clammy perspiration.

November 23, 1858. Invalided.

78th Regt.—Private John Daniels; wounded at Lucknow by a musket-ball, which entered below the right scapula, and passed out about two inches further forward; re-entered in the axilla, and came out about the middle of the inner edge of the deltoid. He was shot from behind while loading his firelock.

July 13th. Wounds healed. Loss of sensation and motion in arm, which is always covered with perspiration.

August 5th, 1858. Invalided.

Class 13.—Sword and Lance Wounds.

Under this head 12 have been admitted, of which 5 have been sent to duty, 1 to modified duty, and 6 invalided. In 2 cases the elbow-joint was wounded; in 5 the forearm; in 2 the back of the wrist: and in 3 cases the fingers and thumbs were injured. In the 6 invalided the condition of the forearm and fingers was more or less injured. In 1 of them both bones of the forearm were severed, with nearly total loss of use of the hand resulting. In another the tendons of the ring-finger of the right hand were cut, and the joint became anchylosed; and in the third there was impaired use of the thumb and index-finger from the extensor tendons having been cut.

In the cases sent to modified duty the elbow-joint had been opened into, followed by anchylosis. There is also a second case of anchylosis of the elbow-joint that has been invalided. Those sent to modified duty had perfectly recovered the use of their limbs.

90th Regt.—Private Joseph Albison, wounded by sabre-cut on the posterior part of the right forearm, about 3 inches above the wrist, which nearly severed both bones. There is now loss of power of the extensor muscles; there is considerable deposition of new osseous matter around the cut bone. The hand is slightly bent inwards, powerless, and he cannot use his fingers, which are in a straight position.

June 15, 1858. Invalided.

9th Lancers.—Private Joseph Twining, wounded at Delhi by a sabre cut on the posterior and under surface of the left elbow-joint, which appears to have cut the external condyle of the humerus and olecranon. No pieces of bone came away, and the wound did not heal completely for three months.

August 2nd. Wound healed. Elbow-joint in a bent position, and completely anchylosed. Cannot pronate and supinate the hand.

September 3, 1858. Sent to modified duty.

Class 14.—Bayonet Wounds.

Only 2 cases of this description of injury are returned as having arrived from India. One was a wound in the back, close to the spinous processes, and he was sent to duty; and the other was in the forearm; and, from the man's account, the ulnar artery was wounded, and tied at the wound of entrance.

The following preparation of a bayonet wound of the brain through the orbital plate of the frontal bone ought to have been placed under "Sabre or Bayonet Wounds of the Head:"—

No. 2792. Left orbit, exhibiting a small punctured fracture of the orbital plate of the frontal bone, just above the os unguis; the margins of the fracture are driven inwards. This was produced by an accidental wound from a bayonet. The wound in the skin was very small, and soon healed, but the patient had pain in the head, fever, then coma, and death on the twelfth day after the injury. A small triangular portion of the fracture was elevated inwards and sticking in the dura mater, and the membranes of the brain were inflamed near the wound, and covered with puriform matter.—*Donor, Dr. Young, Surgeon, 95th Regiment.*

Class 15.—Miscellanous Wounds and Injuries received in Action.

9 have been admitted, of which 2 have been sent to duty, 1 to modified duty, and 1 invalided. 3 were caused by ex-

plosion of gunpowder, producing severe burns, and 1 by a fall from a ladder at Lucknow when examining a mine belonging to the enemy, injuring his leg. One had lost his ear, and another an eye.

Balls, Missiles, &c.—No. 2952. Specimen of the matchlock-ball used by the inhabitants of the Euzuffeii country in the Himalayas, extracted from a wound received in action.—*Donor, Dr. Jephson, A. S., 9th Lancers.*

No. 2953. Rifle-ball which was lodged near the hip-joint from a Malay of Ceylon Rifle Regiment. Result, abscess and death.—*Donor, Mr. Swettenham, A. S. S.*

No. 2957. Grape-shot, weight 6 oz., from the thigh of Sergeant Brown, 14th Regt., invalided for shortening and much impaired use of left leg, after gunshot compound comminuted fracture of the left thigh at the siege of Sebastopol.—*Donor, J. R. Taylor, C.B., D. I. G.*

No. 2958. Cast of a ball. This grape-shot fractured the alveolar process of the superior maxillary bone, and passed downwards, and lodged in the right side of the neck, having fractured the lower jaw, a portion of which was extracted with some of the teeth. The ball weighed 1 lb. 3½ oz., and was removed by a careful dissection, as it was lying close to the carotid. He still complains of slight pain when pressure is made on the lower jaw, and he can only make use of liquid diet.

No. 2951. Three pieces of coin removed from the thigh. "A Hanoverian soldier received a severe wound from a grape-shot which struck him on the external part of the thigh, producing very extensive laceration. On the second day he was brought to hospital, and the usual dressings applied. On the fifth day a long, narrow passage was discovered by the probe, seeming to run nearly the whole length of the vastus externus muscle. On cutting into this, three pieces of coin (which, from the very curious way in which they were compacted, I thought worthy of being presented to the Director-General of Hospitals) were extracted from the parts.

"This poor fellow, a raw recruit, had no money whatever about him, nor even a pocket to contain it, and fervently protested against his right to this forced loan. He accounted for it by supposing it was carried from the pocket of his comrade, who stood before him in the ranks, and who was killed by the same shot.

"The coins, consisting of two five-franc pieces, were obviously first struck by the shot, and carried along by it. For nearly one half of their surfaces the silver pieces adhered

closely together; on the other, where the ball had struck their edges, the metal was flattened out, and somewhat hollowed. In this hollow lay the copper coin, in some degree adapted to the shape of the depression in the larger pieces.

"I cannot omit noticing here a trait strongly illustrative of the mobility of mind which characterizes soldiers, and their proneness to superstition and belief in omens, which a surgeon acquainted with their character may often turn to their benefit.

"The part of these two coins which had been flattened out happened to be that on which Napoleon's head was impressed. From one it was nearly effaced, and on observing this circumstance to the patient and his comrades, an universal burst of joy echoed through the ward. The young Hanoverian exulted in the share he conceived he personally had of contributing to the downfall of the French Emperor. His health rapidly improved, and I have no doubt this simple circumstance had a good effect upon every man who witnessed it."—*Donor, Dr. Guthrie, D. I. G.*

AMPUTATIONS.

Total number of amputations, 158. Of these, 3 have been sent to duty; 21 to modified duty; 123 invalided; 2 died; and 9 remain undisposed of.

It may be mentioned that Mr. Heather Bigg supplied the men with every mechanical appliance, on the most approved principle which his experience could suggest.

Amputation at the Shoulder-Joint.—6 have been admitted and invalided; only 1 remained unhealed. 4 were by the superior and inferior flap; and 2 by the anterior and posterior flaps; the stumps were all good and round, and the integuments not puckered; both methods of operating gave equally good results: all were done under the influence of chloroform; all were primary operations.

In the following case the stump sloughed.

Rifles (2nd Battalion).—Private James Gayler, wounded at Cawnpore, November 28, 1857, by a grape-shot, which shattered the arm. Amputation was performed at the shoulder-joint, three hours after the injury, under the influence of chloroform, by anterior and posterior flaps; the ligature did not come away for some time, and caused considerable irritation; sloughing also took place, with much suppuration.

July 11, 1858. The stump is good and solid, although there are three small portions of the margins of the flaps unhealed, with exuberant granulations arising from them.

September 3, 1858. Modified duty.

The two following preparations are good examples of necrosis affecting the stump of the humerus, comprising nearly the entire thickness of the shaft, occurring in a very scrofulous subject, and which demanded secondary amputation at the shoulder-joint, two years after the primary operation. Death from pyemia ten days after the last operation. No. 2916. Section of the stump (in spirits) of the upper half of the humerus, removed by secondary amputation at the shoulder-joint. A portion of the upper part of the shaft of the bone, immediately below the neck, about two and a half inches in length, and comprising nearly the entire thickness of the shaft of the humerus, is necrosed; the necrosed portion is firmly enclosed in a case of new bony deposit, through which there are two apertures opening externally; the medullary membrane is soft, spongy, and inflamed; the medullary canal is open inferiorly at the amputated extremity, and allowed of the free escape of discharge; a thick layer of new bone entirely surrounds the whole of the shaft. No. 2917. Is a section (dry preparation) of the preceding. The entire shaft of the bone, with the exception of its neck, is surrounded by a thick, granular deposit of new bone. The compact structure of the old bone is soft and cellulous; the medullary canal is also rough and spongy, the result of inflammation of its lining membrane; there is also an aperture in the neck of the bone, communicating with the medullary canal.—*Donor, Dr. Dane, Staff-Surgeon.* This specimen was taken from Private James Clarke, 77th Regiment, aged 21, of highly strumous diathesis and unhealthy aspect. He had suffered amputation of the arm about the middle third, in May, 1854, in consequence of severe gunshot wound, and, on admission into hospital at Colchester, September 4, 1855, the wound was healed through the greater part of its extent, but there were two small sinuses opening on the face of the stump, which discharged profusely, and dead bone could be detected by a probe through each of them; his appetite was bad, and general health indifferent.

April 19, 1856. His progress was so unsatisfactory that the operation of removing the stump, at the shoulder-joint, was decided upon, as the only chance of saving his life. He was low after the operation, but rallied, and seemed likely to do well, until the 23rd, when he became low, irritable, and unable to take nourishment; constant nausea and diarrhœa set in, and a train of inflammatory symptoms, under which he gradually sank, and died on May 1, 1856.

At the post-mortem examination, the liver was found large and friable; the right kidney diseased; serous effusion in the

peritoneal cavity and deposits, marking the existence of subacute peritonitis; and the intestines were soft, dark, and injected. The whole structures around the shoulder-joint were abnormal and degenerated; and the clavicle, scapula, and first rib extensively affected with disease, similar to that exhibited in the preparation of the humerus. The cancellous structure appeared disorganized, dark, spongy, and soft, and filled with a dark brown fluid (which was not found in the humerus when removed), in which it appears that the bony structure was gradually becoming, as it were, dissolved, but there was no attempt at formation of new bone around, as in the arm.

The two succeeding preparations from two soldiers of the same regiment, who received compound comminuted fracture of both bones of the forearm, at Inkerman, November 5, 1854. Amputation at the centre of the arm was immediately performed. Necrosis followed in both cases, and amputation at the shoulder-joint was performed on both patients, July 25, 1855, eight months after the primary operations.

The necrosis in the preceding preparation, No. 2916, and the two under notice, appears to have originated in inflammation of the medullary membrane and canal.

No. 2918. The necrosed portion comprises the entire thickness of the end of the shaft, and is about five inches in length, nearly detached, and partly surrounded by a new osseous case. From Private James Leman.—*Donor, Dr. Browne, Assistant-Surgeon, Coldstream Guards.*

No. 2919. The necrosed portion comprises the entire thickness of the shaft, and is about two inches in length, and is not situated at the end of the stump, but at the upper part of the shaft, close to the tubercle, and is partly surrounded by new osseous matter. From James Curds.—*Donor, Dr. Munro, Surgeon-Major, Coldstream Guards.*

Amputation of the Arm.—46 cases have been admitted, of which 3 have been sent to modified duty; 40 invalided; 1 died; and 2 remain undisposed of. Of these, 33 were in the middle of the arm, and 12 in the upper third; 1 quite close to the tubercle; 41 were healed, and 5 still remain open; in 37 instances the cicatrix did not adhere to the bone; and in 9 cases it was found to adhere to a greater or less extent, generally very slightly.

In 36 instances the flap operation appears to have been performed, and the circular method 8 times. 30 operations were done under the influence of chloroform, and 14 cases without this agent. 35 were primary, and 11 secondary amputation. In 3 cases severe sloughing of the stump followed.

2 of them ultimately recovered; the third died at Fort Pitt. In 1 case there was also anchylosis of the shoulder-joint, resulting from the injury caused by round-shot.

The following is an example of sloughing taking place in the stump, along with hemorrhage from some small vessel, occurring in a scrofulous subject after a second amputation in the arm. It also shows how difficult it would have been to have found and secured the bleeding vessel in this case.

32nd Regt.—John Healy, aged 20, wounded at Lucknow, September 5, 1857, by a round shot on the right wrist, carrying away the hand. The forearm was amputated the same day by double flaps under chloroform. The stump assumed an unhealthy appearance, and sloughed. One large piece of bone came away. Amputation was a second time performed on board the ship, at the Cape of Good Hope, April 13, 1858, eight months after the accident. The stump has never entirely healed.

Fort Pitt, June 11, 1858. There is now considerable inflammation around the stump, particularly along its inner side, and the cicatrix was raised and œdematous. It is probable that the bone is again diseased. There was thick, purulent discharge from the stump, but he did not complain of pain in it. Appetite impaired, and bowels constipated, he is of a very strumous diathesis. On June 17 matter formed on the inner side of the stump: distinct fluctuation could be felt. On the 23rd, the stump became suddenly very painful, redder, and more tense, and an incision was made into it, from which was discharged dark coagulated blood. He was in a very low, anemic state. Oozing of blood took place from the stump, which was restrained by the application of ice. He gradually became weaker, and died on June 27th.

Treatment.—Nourishing diet, wine, quina, &c. To the stump, fomentations, poultices, cold applications, and iced, as the state of the case required.

Sectio Cadaveris, twelve hours after death.—*Cranium.*—Brain healthy. *Thorax.*—Heart empty; blood pale, and destitute of red globules; lungs œdematous, but otherwise healthy. *Abdomen.*—Convex surface of the right lobe of the liver adhered to the diaphragm by old bands of adhesion, and a few slight depressions, resembling cicatrices. The other viscera in this cavity were healthy, with the exception of being pale and bloodless; veins healthy.

Stump tense and swollen, with several incisions on its surface, from two of which large coagula projected. The stump was of a very fœtid and gangrenous smell, and on cutting into

it a very large cavity was found to extend from the extremity of the bone up along its inner side into the axilla, as far as the first rib, completely dissecting the axillary vessels and nerves, and likewise the muscles of the arm; the shoulder-joint was opened into by absorption of the capsular ligaments, the cartilage covering the head of the bone and glenoid cavity being discoloured by the blood, but not diseased. The vessels from which the blood was poured out could not be detected even by careful dissection, showing how difficult, or almost impossible, it would have been to find the bleeding vessel, or even the axillary itself, in such a case in the living subject. A small portion of the extremity of the amputated humerus was bare and carious, which probably was the origin of the deep-seated inflammation and suppuration, causing ulceration of one of the smaller bloodvessels, and consequent hemorrhage, followed by a gangrenous state of the stump, and death from exhaustion. Preparation No. 3632. Stump of the right humerus after secondary amputation, resulting from a gunshot wound. The end of the bone shows that the medullary canal has not been closed, although nature has attempted to do so to some extent, and the end is partially rounded off; the shaft of the bone is roughened, particularly below the head of the bone, where it is denuded of periosteum, and is carious.

The following case shows anchylosis of the shoulder-joint after amputation of the upper third of the arm:—

32nd Regt.—Private John Day, wounded at Lucknow, August 27, 1857, by a round-shot, which carried away a great portion of the upper arm, shattered the humerus, and left the large vessels and nerves hanging loose. Amputation was performed by the circular method, one hour after, under chloroform, at the upper third, close to the insertion of the deltoid. Exfoliation of the extremity of the bone took place, and it was extracted June 29th.

August 16, 1858. Wound healed; cicatrix adherent to the end of the bone; shoulder-joint anchylosed, the result of the injury and surrounding inflammation.

September 2, 1858. Sent to modified duty.

Amputation of the Forearm.—19 cases were admitted, of which 1 has been sent to modified duty, 17 invalided, and 1 remains undisposed of. All have apparently been performed by double flap. 16 were done under the influence of chloroform; 15 were primary, and 4 secondary amputations; 4 in the upper, 11 in the middle, and 2 in the lower third. All were healed. In no instance was the integument adherent to the bone; the stumps were good.

Amputation of the Thumb.—12 were admitted. 1 has been sent to duty, 5 to modified duty, 5 invalided, and 1 remains undisposed of. All were healed.

Amputation of the Fingers.—38 were admitted, of which 1 has been sent to duty, 10 to modified duty, 26 invalided, and 1 remains undisposed of.

There were several good examples of conservative surgery, where the whole of the hand had been taken away, with the exception of the thumb and forefinger. In many cases, where one or more fingers had been amputated, the others had become so bent and contracted that forcible extension had to be employed, with very good results.

Amputation at the Hip.—The following case is interesting, as being, perhaps, the first successful case of amputation at the hip-joint after a gunshot fracture:—No. 2929. Head of the femur removed by amputation at the hip at Brussels after the battle of Waterloo. The fracture extends obliquely downwards from the neck of the bone through the shaft, leaving the trochanter minor only attached to the head of the femur.—*Donor, Mr. Guthrie, D.I.G.* This specimen was taken from Francois de Gay, Private in the 45th Regiment of French Infantry.—He was wounded at the battle of Waterloo by a musket-ball, which entered behind, fractured the neck of the femur, and made its exit anteriorly, about four inches below the groin. He was admitted into the Elizabeth Hospital, July 5, 1815, much exhausted. In addition to his wounds, which had put on a sloughing appearance, he suffered from an extensive sore on the sacrum, which was caused by lying on the wet ground for five days. Amputation was performed on the 7th, nineteen days after the injury.

In September the wounds were healed, and he was capable of walking three miles at a time, the wooden leg which he had attached to his body being thrown forward by an exertion of the muscles of the trunk. He was placed in the Hotel des Invalides.

Amputation of the Thigh.—11 have been admitted, 9 invalided, 1 died, and 1 remains; 1 only occurred in the upper third, and 10 in the middle third; 1 died. All appeared to have been flap operations, and performed under the influence of chloroform. In 8 instances the integument was not adherent to the bone, and the stumps were very good. In 3 cases the skin adhered very slightly, but the covering was still good. 3 cases remained unhealed. The case at the upper third of the thigh was performed by anterior and posterior flaps, forty-six days after, under chloroform. The wound

healed; stump good; and skin not adherent. The stump was so short that it could not be retained in the bucket by any contrivance of Mr. Heather Bigg. In 8 cases amputation was performed from one to twelve hours after the accident; in 1 case from one to two days; in 1 case from three to seven days; in 1 from eight days to one month. 4 were apparently by lateral flaps, and 6 were by the anterior and posterior flaps, and in the other case the mode of operating is not stated.

The following case, from India, is an example of extensive necrosis of the shaft of the stump of the femur, causing death from exhaustion:—

2nd Battalion Rifles.—Private John Sole, aged 24, wounded November 28, 1857, at Cawnpore, on the right leg, by a grape-shot. Amputation was immediately performed at the middle of the thigh. He was admitted into Detachment Hospital, Gravesend, on July 8, 1858, from on board ship. He was much emaciated. The stump had never been properly healed, and on board ship it sloughed. There were several unhealthy-looking sores on the stump along the line of incision, with a profuse discharge. After being in hospital he improved considerably, sores appearing more healthy, and for a time he gained both flesh and strength. He occasionally complains of great pain in the stump, referring it to the end of the bone. About three weeks before his death a swelling of considerable size appeared on the outer surface of the stump, which burst, and a large quantity of unhealthy pus escaped, and dead bone was detected through the newly opened sore. He now began to lose flesh and strength; the discharge increased from all the sores, appetite bad, stomach very irritable, and bed-sores appeared. He died on September 11, 1858.

All the viscera in the different cavities were healthy. The following is a description of the stump of the femur:—Preparation No. 3625. Right femur showing necrosis of the internal layer of the shaft of the bone, the result of amputation, at the middle third, after a gunshot injury. The preparation exhibits the extremity of the stump, where the saw was applied, in a necrosed state; and it shows the smooth surface left by the saw as plainly as when recently done. This portion consists of the entire thickness of the bone; and there is also a mark on its side where the saw had been accidentally applied, and apparently destroyed the periosteum. A thin lamina of necrosed bone extends upwards, to within an inch of the trochanter major lying encased in the old and new shaft. The shaft of the bone has become expanded and opened out in texture, and

covered with large irregular nodules of new bone. There are three cloacæ on the anterior surface of the femur, and one three inches in length posteriorly at the linea aspera, through which the necrosed portions can be seen. The extremity of the stump presents a large aperture one inch in diameter, leading into the medullary canal; and through it the necrosed portions can be drawn out. The disease seems to have commenced by inflammation in the medullary membrane, producing necrosis of a thin layer of the shaft. The old shaft still remains, and is covered with new bone, except at the very extremity, where the saw was applied; and it is probable that the scratch made with the saw was the primary cause of the death of the bone, and also of the inflammation of the medullary membrane.

The following is an interesting case in several points of view. It shows a wound of the knee-joint, followed by complete disorganization of its structure, demanding amputation three months after the injury. The stump had nearly healed when he was attacked with acute ostitis; and he died from exhaustion forty-four days after the limb was amputated. No. 2940. Femur showing the results of periostitis following amputation at the lower third of the thigh. Nearly ten inches of the shaft of the bone is either necrosed, or in a dying state, and is partially encased in a new bony shell. It also shows that the periosteum has a large share in the generation of new bone.—*Donor, Dr. Williams, Assistant-Surgeon, Rifle Brigade.* This specimen was taken from Private John Walsend, aged 29. Wounded September 8, 1855, by a bullet through the integument of the knee. There being every probability that the joint was injured, perfect rest was enjoined, and leeches, fomentations, &c., applied. These means were ineffectual for restraining the inflammation. The joint appeared quite disorganized, and constantly discharged purulent matter. Amputation was performed on the 2nd November, 1855. On the 15th the wound had almost healed up, when he was attacked by acute ostitis in the shaft of the bone. The great suffering attending the inflammation wore out his strength, and he died on the 16th December, much exhausted and emaciated.

Amputation of the Leg.—18 have been admitted. 17 have been invalided, and 1 remains undisposed of. 11 were performed at the middle third, 4 at the upper third, and 2 at the lower third. 15 appeared to have been performed by the usual flap operation, but in 2 of them a large anterior flap was also made of integuments, in 1 of which the stump was good, and in the other the skin was adherent. 2 were by the circular method, and in both of them the skin was adhe-

ent; but still these two stumps were as good as any of those by the flap. 14 cases were operated upon under the influence of chloroform, and 3 without it. In 8 instances, out of the total 18 cases, were the integuments free, and movable over the crest of the tibia. In 3 cases only were the stumps unhealed. 16 were primary, and 2 secondary amputations.

The following is an interesting example of the foot having been shattered by round-shot, requiring immediate amputation, and where there also existed a simple fracture of the femur of the same thigh, which was not discovered for six weeks after.

78th Regiment.—Private Duncan M'Rae, aged 36, wounded September 24, 1857, at Lucknow, by a round-shot striking the left foot, and carrying it away; at the same time he received an oblique fracture of the lower and middle thirds of the same thigh, which was not detected for six weeks after. The leg was amputated four inches below the knee, by the flap operation, about a quarter of an hour after, under chloroform.

June 11, 1858. There is now a good stump, and the skin does not adhere to the bone. The femur appears to have been fractured obliquely, commencing about four inches above the knee; one extremity of the bone is found to project in front, and a groove is felt to proceed upwards and backwards to the posterior part of the middle of the femur. The knee-joint cannot be completely extended or perfectly flexed, so as to fit a leg stump, in consequence of the contraction of the rectus and vastus muscles. The left femur is an inch and a half shorter than the right, and he states that it only united on the passage home. Invalided August 18, 1858.

One case of amputation at the ankle-joint was performed, eight hours after the accident, in the 75th Regiment; and a very good stump resulted.

With regard to the respective merits of the two methods of amputation at the ankle-joint, viz., that recommended by Mr. Syme, and that by Pirogoff, the profession has not yet come to a decision. Still, there appears to be some advantage in the latter, as being easier of execution, giving a longer stump and firmer support. In Pirogoff's operation, when the ends of the tibia and fibula are sawn straight across, there is always great difficulty, or rather almost an impossibility, in bringing the calcaneum into apposition with the end of the tibia; so that it has been found necessary to remove several slices of the calcaneum with a strong bistoury before the bones could be brought to fit properly. To remedy this difficulty, the following modification was adopted in a case operated upon by Staff-Surgeon Dr. Williamson, on the 24th December, 1858, at Fort Pitt.

The articular extremities of the tibia and fibula were sawn off obliquely, the thick part of the wedge-shaped pieces being posterior. The os calcis fitted admirably. The wound healed rapidly, and a very good, solid stump resulted. The sawing of the ends of the bones obliquely is an improvement, and is well worthy of being generally adopted, as allowing of easy adaptation of the calcaneum to the ends of the leg-bones.

Two cases of amputation through the medio-tarsus arrived from India. In one the operation was performed three hours and a half after the injury from a musket-ball through the arch of the foot. In the other the operation was performed twelve days after the accident. In both cases the stumps were good.

EXCISIONS.

3 cases of resection of joints have arrived from India, viz., 1 of the shoulder, and 2 of the elbow-joint.

Out of a total number of 36 primary resections that occurred in the Crimean war—of which 28 were performed on the superior, and 8 on the lower extremity—of the former 6 died, and of the latter 4 died, viz., 4 cases of excision of the head of the femur.

Shoulder-Joint.—Only one case of resection of this joint was admitted from India; but there is another case where a secondary operation was performed at Fort Pitt, in a patient who is returned as a wound of the joint.

In the Crimean war the head of the humerus was removed twice as a primary operation during the first period of the war, or that ending March, 1855, and 8 times during the second. 1 of the two first-mentioned ended in death, and of the 8 subsequent operations only 1 proved fatal.

The head of the bone was five times removed as a secondary operation, without a single casualty, all the cases except one making good and comparatively rapid recoveries. In addition to these, there was a case in which the head of the bone and a large portion of the scapula, broken into fragments, were removed.

Out of the total number, then, of 16 cases, 3 deaths took place, or 18·9 per cent. Had this operation not been resorted to, amputation at the shoulder-joint, it is believed, would have become necessary in all.

19 cases of resection occurred during the Schleswig Holstein war. Of these, 7 died, and 12 recovered with useful and movable articulations. Of the 7 fatal cases, 2 were primary operations, 2 were performed during the reaction stage, and 3 were secondary resections.

This mortality at first sight appears rather high; but the

conditions under which they were performed must be taken into consideration: they were done, as Esmarch states, under circumstances in which more than a third of all amputations of the arm died. They died of pyemia. Stromeyer and Esmarch both agree that the most favourable time for resection is either within the first twenty-four hours, or when suppuration is fully established.

Abscesses and sinuses are apt to form in the vicinity of the joint, and occasionally cause considerable trouble. A good deal of this depends upon the form of incision selected, so as to allow of the free discharge of pus. Bandens, who has had great experience, recommends the straight incision, so as to avoid cutting the fibres of the deltoid, and it is also necessary to save the long tendon of the biceps, if possible.

Stromeyer advocates the semicircular incision over the posterior surface of the joint, which certainly allows of the free exit of pus; but to cut across the fibres of the deltoid must in some degree impair the limb, although Esmarch states that to cut across the fibres of the deltoid does not much interfere with its after usefulness. Even in those cases where the single incision has been employed, the patient frequently has very little or no power of raising the arm from the side, as was exemplified in the case of Private James M'Donald, 79th Regiment, from the war in India, and others that have come under notice here.

As there are generally two apertures, the surgeon may wish to include them in his incision; but each method will possibly be found to suit in different cases. It is seldom necessary to take away more than the head and a portion of the shaft—perhaps nearly as low as the insertion of the deltoid; but in the Schleswig Holstein war it is shown that as much as four inches and a half were removed from the humerus, and yet a most useful arm remained.

Esmarch makes the following observation:—"It is curious that the operation on the left side seems to give less favourable results than on the right. 6 of 12 died of those resected on the left; 1 out of 7 of those resected in the shoulder on the right side. A similar proportion held good in resections of the elbow, in whom, of those operated upon on the left, 4 in 19, on the right 2 in 20 resections proved fatal. From this, the fatality attending operations on the left arm to that on the right is as 3 to 1; but of course further observations are required to enable conclusions to be deduced."

The following is a primary case of excision of the head of the humerus by one straight incision, from India:—

Private James M'Donald, 79th Highlanders, wounded at Lucknow, March 11, 1858, by a musket-ball, which struck him in the left shoulder, splintering the head and shaft of the humerus to a considerable extent. The ball then passed backwards and downwards, injuring the lower angle of the scapula, and lodged between that bone and the ribs, from which position it was extracted. The shattered parts of the head of the humerus and part of the shaft were excised the same day, by one long incision through the anterior part of the deltoid muscle.

September 26, 1858. There is a large cicatrix in front of the shoulder-joint, and a sinus in its centre, leading down to diseased bone. He cannot raise the arm from the side, on account of loss of power over the deltoid.

He has been sent to modified duty, December 22, 1858.

The two following cases of secondary operations are good examples of perforating gunshot wounds through the head of the humerus, followed by anchylosis of the joint, and the track of the ball remaining carious, necessitating resection of the head of the bone:—

93rd Regt.—Private John Frazer, aged 33, seventeen years' service. Was wounded at Lucknow, March 14, 1858, by a musket-ball, which entered the left shoulder beneath the acromion, and passed backwards, apparently through the humerus, close to its head.

March 2, 1859. There is now anchylosis of the shoulder-joint. Much dead bone in fragments can be felt both from the anterior and posterior openings. General health good.

17th. The head of the humerus was excised, and it shows the track of the ball to be in a carious state. Numerous smaller pieces were also taken away by the gouge. Invalided.

9th Regt.—Private John Morgan, aged 39. Eighteen years' service, ten of them in India. Was wounded in action at Idaliff, in September, 1842, the ball passing through the right shoulder-joint and injuring the scapula. On admission into Fort Pitt Hospital, June 9, 1844, there were three sinuses, two on the anterior aspect of the joint, one opposite the coracoid process, where the ball entered, and the other at the lower border of the axilla, and another on the posterior aspect, the exit of the ball, each communicating with diseased bone. Excision was performed on June 22, 1844, by Assistant-Surgeon Dr. Williamson; a semilunar flap was made of the deltoid, embracing the entrance and exit of the ball; and on attempting to dislocate the humerus, this was found impossible, on account of complete anchylosis of the joint. The humerus was sawn across

about two inches below its head, then cleared of soft parts, and raised; its attachment to the glenoid cavity was broken down by means of cutting pliers. The wound healed quickly, and he gradually regained the power of motion in the arm. No. 2919. Head and neck of the right humerus, which was excised on account of caries consequent on a gunshot wound. The large, deep groove is the track of the ball; it is carious a little below the groove. There is an aperture, about one-fourth of an inch in diameter, situated on the inner aspect of the bone, leading into the medullary cavity. The tubercles and upper part of the shaft are enlarged from depositions of new osseous matter.

Resection of the Shaft of the Humerus.—The following preparation, where three-quarters of an inch of the shaft of the humerus were resected in a case of comminuted fracture eight months after the injury. Death from pyemia one month after the operation. No. 2920. Humerus exhibiting a gunshot fracture below its centre. The end of the lower portion is healthy. There is a superficial exfoliation of a large portion of the outer layer of the shaft of the superior fragment, and also of the medullary canal.—*Donor, C. Reade, Staff Surgeon.* 95th Regt.—Private Thomas, aged twenty-two years, when on duty in the trenches before Sebastopol, was struck by a fragment of shell on the left arm, producing a compound comminuted fracture of the humerus, an inch below its centre, August 18, 1855. On admission into Brompton Hospital, February 18, 1856, the wound had healed, but re-opened on April 18th. At this time firm ligamentous union had taken place between the ends of the fractured bone, and a false joint had been established.

On April 22nd he was in an excellent state of health. It was determined to perform the usual operation for effecting union of the shafts of the bone. A free and deep incision was made in the outer aspect of the left arm, about an inch below the insertion of the deltoid muscle, and carrying it perpendicularly downwards to a level with the condyles, dividing, amongst other muscles, the outer belly of the triceps. Owing to the obliquity of the fracture, and the strength of the ligamentous structure holding the bones together, some difficulty was experienced in passing the knife through the ends of the bones. After further dissection, three-quarters of an inch were sawn off with a metacarpal saw from the fractured ends.

There was but little blood lost during the operation, though several ligatures had to be applied. The patient was under the influence of chloroform. Some considerable time after, he was removed to his ward, and reaction had taken place;

profuse hemorrhage occurred from the wound, probably from deeply seated muscular branches, but was stopped eventually by the application of ice. The limb was placed in a gutta-percha splint. On the evening of the following day the patient was feverish, with hot and dry skin, quick pulse, flushed face, and great thirst. He went on favourably till the 27th, when he had an attack of what is described as intermittent fever. On the 30th he was improving in health, the wound contracting and granulating. Discharge profuse, but healthy. On the 1st, 2nd, and 3rd May he was slightly delirious, and so restless that the limb was constantly disturbed. On the 4th severe dyspnœa came on. The wound still continued to contract, and the discharge was healthy. On the 8th he had a slight attack of shivering. All the ligatures came away. Continued to gain strength up to the 17th. His appetite was enormous; bilious vomiting came on, owing, as was supposed, to the mixture of some incompatible articles of extra diet. On the 19th he passed a restless night. The vomiting stopped, but there was a good deal of nausea. Had a severe attack of dyspnœa, with short cough, and symptoms of congested lungs, especially of the left. Tongue furred; discharge from the wound less. The cough and dyspnœa more severe, and the heart's action very rapid. These symptoms continued to increase, especially those of pericardial effusion, and he died on May 21st.

Sectio Cadaveris, thirty-three hours after death.—Pericardium contained two pints of turbid serum, and was coated with a thick layer of recent effused lymph of a granular appearance, with several patches of vascularity. Valves healthy; both lungs congested; liver healthy. An abscess was found in the external margin of the spleen. *Left Kidney.*—There was an abscess, about the size of a walnut, on its upper and inner surface, immediately below the capsule. There was also a similar abscess in the right kidney. Stomach and intestines healthy; veins not examined.

In the case of Major M., recorded under the head of "Fracture of the Humerus," resection may also ultimately be required.

Elbow-Joint.—Two cases of excision of this joint arrived from India, and are interesting. In one there had also been a fracture of the humerus, and the arm is now in an extended position, and the motion of the elbow-joint is very limited; in the other, the arm hangs powerless by the side, like a flail, without strength to raise the forearm, and he can only move the thumb and fingers slightly; it is so useless and cumber-

some, that he has frequently requested me to amputate the arm; this has not been done, because, when he keeps the arm in a sling, he has still the use of the fingers and thumb. In this case a very large extent of the ends of the bones of the elbow-joint must have been removed, and also the tubercle of the radius, with the attachment of the biceps; the distance between the bones is very great, and there does not appear to be ligamentous matter effused between the bones. The man himself, when out of hospital, does not use the sling; consequently, the arm is so much in his way that he fell down when under the influence of liquor, and injured it very much. In both these cases the operation was performed by the H incision.

The extent of the articular ends of the bones that can be removed, compatible with a useful limb, should be such as to allow of free motion between the ends of the bones, so that there can be no fear of their becoming jammed. It appears that about one inch or one inch and a half, of all the three bones composing the joint, should be always about the extent removed.

When only a small extent of the articular ends of the bones is removed, anchylosis is almost certain to be the result, from the extremities of the bones becoming jammed, and preventing free motion even from the first.

Partial resection of the shoulder and elbow-joints does not permit of nearly so much motion as where the entire articular surfaces are removed, and they generally terminate in partial or complete anchylosis, as occurred in a case on which I operated lately; and there is one arrived from India, where the joint is anchylosed, with the arm in a straight position, and hanging quite useless by the side, but, as already stated, there was also a fracture of the humerus in this instance.

In all cases of gunshot wounds of the elbow and shoulder-joints, where there is direct injury of the capsule, with fracture or splintering of the bones forming the articulation, primary resection should, as a rule, be performed on every occasion, as being more certain to terminate in a speedy cure, and to leave a much more useful limb, with a good artificial joint, than where the case is left to nature, when the track of the ball and joint itself generally become carious, and continue to discharge for years, ultimately requiring resection to be performed.

The cases of Frazer and Morgan are examples of the above remark in reference to the shoulder-joint; and there are several cases of wounds in the elbow and shoulder-joints from India where complete anchylosis has taken place, and which would have much more useful limbs had excision been performed with the usual amount of success.

5th Regt.—Private Thomas Johnstone, aged 30, wounded at Mussleagh, by a sword-cut in five different places, March 19, 1858. One wound opened freely into the right elbow-joint, and severely wounded the radius and humerus, necessitating excision, by the H incision, of this joint, which was performed two days after; this had been deferred until then, on account of the movements of the forces. Another shot carried away the left thumb, which was amputated.

September 26th. The arm hung powerless by his side, and he has not the power of raising the forearm; he can use his fingers; the ulnar nerve seems to have been injured, as he has not the feeling of the ring and little fingers; when his arm is supported in a sling he will still have a useful forearm. Invalided, December 29, 1858.

75th Regt.—Sergeant John M'Donald, aged 26, wounded at Delhi, June 15, 1857, by a musket-ball, in the posterior part of the left elbow-joint. Excision, by H incision, of the fractured parts was immediately performed, and several pieces of bone came away at the time, and several pieces came away afterwards.

July 20, 1858. Wound healed; arm in an extended position, and can be only slightly bent; he cannot open the little and ring fingers, and the others are also powerless. The arm is about three inches shorter than the right. September 8, 1858, sent to modified duty.

In the Crimean war "22 operations in all were done on the elbow-joint, of which 3 ended fatally, and 2 more deaths took place after secondary amputation; in all a total of 5 deaths, or 22 per cent. of the cases treated. This per-centage slightly exceeds that of resection of the shoulder-joint, but in both instances resection afforded a much more favourable result as to the mortality, than amputation."

In the following case, on which I recently operated on account of disease,—and where I took away the whole of the ulna, two inches of the humerus, and the head and neck of the radius close to the tubercle,—the man can now (four months after the operation) bend his forearm, raise his hand behind his head, and lift a twenty-eight pound weight from the ground; he can also pronate and supinate the hand; there is no anchylosis of the wrist-joint, and he can use his fingers well.

This case also shows the large amount of bone which can be removed from the upper extremity compatible with the patient regaining a very useful arm and hand; and although not resulting from a gunshot wound, still it appears of sufficient interest to be given here.

Staff Armourer Sergeant H. W., aged 26, two years and a half in the service, of which five months were in China. He is of healthy appearance. Was admitted into the general hospital, Hong Kong, in August, 1857, immediately after his arrival from England, with symptoms of acute hepatitis and pleuritis. Active depletion was had recourse to, and calomel and opium administered, which produced salivation, and the disease was arrested ; on the 3rd September a large phlegmonoid tumour was found near the elbow-joint, which was opened, and a large quantity of matter evacuated. From that time the ulna became permanently enlarged, extensive necrosis took place, and a few spiculæ of bone came away. He was admitted into Fort Pitt Hospital on the 1st of August, 1858, with numerous sinuses along the inner side of the left ulna, extending down to the diseased bone, and the probe also entered from behind into the elbow-joint. The disease in the ulna was imagined to terminate about an inch above the wrist, but to extend into the elbow-joint. The radius did not appear to be engaged in the disease. The patient's general health was good.

August 30th. The whole of the ulna, as well as an inch and a half of the extremity of the humerus, and also the head and neck of the radius, were removed by a single incision along the posterior and inner side of the forearm by Staff-Surgeon Dr. Williamson. The skin was dissected back, and the ulnar nerve cleared away from the internal condyle. The disease was found to extend the entire length of the ulna. An endeavour was at first made to disarticulate at the wrist by cutting the lower attachments of the ulna ; but it was found to be much more easily accomplished by cutting the triceps and lateral ligaments, and getting into the elbow-joint. The entire ulna was now disarticulated and dissected out. An inch and a half of the ends of the humerus and radius were then removed. No vessels required to be tied. The wound was left open for three hours, when sutures were inserted, and the arm placed upon a straight splint.

September 1st. The arm was placed in a semi-bent position, and laid upon a gutta-percha splint.

5th. The whole of the wound had healed by the first intention, and the sutures were removed.

8th. The splint was taken away, and he could move his fingers and hand, and get his left hand to the mouth with the assistance of the right, but could not do so of his own accord.

10th. The wound completely healed twelve days after the operation.

12th. He continues to move the joint and use his finger ;

but is only just able at present to raise the forearm, showing that he is beginning to regain the power over the biceps muscle. The arm is, however, small and weak. There is every prospect of the patient having a very useful arm and hand. His general health is good, and he is out of bed, and going about.

On examination of the parts removed, it was found that the whole of the ulna was much enlarged, from deposition of new osseous matter, enclosing several portions of necrosed bone. The whole of the cartilages covering the ends of the bones forming the elbow-joint were absorbed, and the bones carious.

It is not often that a case occurs where the disease is entirely confined to the ulna and bones of the elbow-joint. With regard to the operation, it was found much more easy to disarticulate from the elbow than from the lower extremity of the ulna, and care was required to avoid cutting the arteries and nerves by keeping close to the bone. It is also worthy of remark that no vessel required to be tied, although they must have been increased in size to supply the enlarged ulna. The rapidity with which the wound healed is also remarkable.

The following is a case of partial excision of the wrist-joint :—

78th Regt.—Corporal David Fotheringham, wounded July 12, 1857, by a musket-ball in the right wrist-joint. The ball entered on the anterior surface, and passed directly out on the posterior. Several small pieces of bone were taken away at the time. The hand has been kept in a straight splint ever since, and he has now nearly lost the use of the fingers. The wrist-joint is much enlarged; the aperture of entrance of ball is long since healed,—that of exit still remains open; diseased bone can be felt.

May 10, 1858. Diseased bone taken away by the gouge.

June 2nd. Invalided. General anchylosis of the carpal bones. Wound nearly healed ; has the use of the fingers to some extent.

Note.—Post-mortem appearances, furnished by Mr. Birkett, in the case of Private James Beahan, who was admitted into Guy's Hospital, December, 1858, and died February 13, 1859, whose case is noticed at page 352 of the last volume.

" The peritoneum and the abdominal viscera were healthy, except adhesions between the spleen and left kidney and colon. In the left loin a fistulous opening led directly into the descending colon ; it passed immediately below the lower edge of the left kidney. A sinus extended downwards behind the left colon, as far as the ilium. A small piece of lead was fixed

in the capsule of the spleen, but gave rise to no disease. Parts of the two lowest left ribs were necrosed. The lumbar vertebræ were slightly curved to the right side. A hole, with smooth edges, was seen between the left transverse processes of the second and third lumbar vertebræ. It corresponded to the inter-vertebral foramen, but was larger than natural, and admitted the finger into the vertebral canal. From this hole the bullet had, doubtless, made its exit into the colon. It was difficult to find the point of entrance of the ball, as the original wound had healed, and the tissues around were much indurated. The cicatrix in the skin of the lumbar region was seated a little to the right of the spinous process of the fourth lumbar vertebra; and on dissecting down to the arches, it was evident that the ball had entered between the arches of the third and fourth lumbar vertebræ, fracturing their arches, and, passing along the third lumbar, made its exit between the tranverse process of the second and third. The arches of the third and fourth lumbar vertebræ, which had probably been broken, were now anchylosed."

It will be remembered that the ball struck him whilst he was crawling along the ground, and it took an upward direction. It entered to the right side of the spinous process of the fourth lumbar vertebra, passed behind the body of the third lumbar and the spinal cord, and, emerging between the transverse process of the second and third lumbar on the left side, entered the left or descending colon, and was voided per anum.

For some weeks after the injury fæcal matter passed by the primary wound, but at last this entirely healed. For a few weeks, although suffering pain, he was free from any fæcal fistula. An abscess then formed in the left loin, which broke, and continued open to the end. Through this, fæces continually passed. Both kidneys were very large, white, and granular. The connective tissue of the body generally was infiltrated with serum.

It is curious to remark the numbers that are wounded, and the proportion that survive under the different classes of gunshot wounds. Take, for example, the total number of cases that arrived from India under wounds of the three large cavities :—

Head, 15, or 2·48 per cent. of the total that arrived, viz., 603. Chest, 19, or 3·16 per cent. Abdomen, 8, or 1·15 per cent.

The numbers from India do not represent the frequency or the mortality of gunshot wounds in those different regions;

but from April 1, 1855, to the end of the Crimean war,[a] the total wounded was 7153. Of these, in the—

Head, 851 treated, or 11·9 per cent. of the entire wounded; 170 died, or 20 per cent. of those treated. Chest, 420 treated, or 5·8 per cent. of the entire wounded; 118 died, or 28·1 per cent. of those treated. Abdomen, 235 treated, or 3.28 per cent. of the entire wounded; 131 died, or 55·7 per cent. of those treated.

From this, it would appear that gunshot wounds of the head (in siege operations, at least) are twice as frequent as those of the chest, and more than three times compared to the abdomen; while wounds of the chest are more than 8 per cent. more fatal than the same injury in the head; and gunshot wounds of the abdomen are 27 per cent. more fatal compared to those of the chest.

On comparing the frequency among the cases from India of—

Gunshot wounds of the superior extremity, 159, or 26·36 per cent. of the total that arrived. Amputation of the superior extremity, 127, or 21·22 per cent. Total, 286, or 47·42 per cent.

Gunshot wounds of inferior extremity, 162, or 27·03 per cent. Amputation of the inferior extremity, 34, or 5·80 per cent. Total, 196, or 30·84 per cent.

From this it is seen that there is only an excess of 3 in the wounds of the lower over that of the upper extremity; but the proportion of successful amputations is very much in favour of the superior extremity, there being 83 more than in the lower extremity. The number of amputations of the arm are 46, and of the thigh, 11. This difference is to be attributed to the greater mortality in amputation of the thigh over that in the arm. The amputations of the forearm and leg are very nearly the same, being 19 of the former, and 18 of the latter. There are 53 amputations of the fingers and thumbs, while there are only 2 of the toes; still, these minor operations raise the proportion of the total number of successful amputations of the superior over the inferior extremity.

In the Crimean war there were—

Gunshot wounds of the superior extremity, 2083 treated, or 30·2 per cent. of the entire wounded; 47 died, or 2·9 per cent. of those treated. Gunshot wounds of the lower extremity, 2198 treated, or 31·76 per cent. of the entire wounded; 166 died, or 8·3 per cent. of those treated.

Had the result of the operations performed been added, the difference would have been increased in a very material degree.

[a] Vide Report.

The number of cases that occurred under the remainder of the classes is very small, as the following extract from the return of the India cases will show :—

Gunshot wounds of the face, 22, or 3·64 per cent. of the entire wounded.

Ditto, neck, 7, or 1·15 per cent.

Ditto, back and spine, 9, or 1·49 per cent.

Ditto, perineum, genital and urinary organs, 3, or 0·49 per cent.

Ditto, with direct penetration of the larger joints, 8, or 1·32 per cent.

Ditto, with direct injury of the large arteries, not being at the same time cases of compound fracture, 0.

Ditto, with direct injury of the larger nerves, not being at the same time cases of compound fracture, 6, or 0·99 per cent.

Sword and lance wounds, 12, or 1·99 per cent.

Bayonet wounds, 2, or 0·33 per cent.

Miscellaneous injuries received in action, 9, or 1·49 per cent.

On referring to the "Return of the Wounded from the Crimean War," nearly the same proportion under these classes is found to hold good :—

Gunshot wounds of the face, 533 treated, or 7·45 per cent. of the entire wounded; 14 died, or 2·60 per cent. of those treated.

Neck, 128 treated, or 1·79 per cent. of the entire wounded; 4 died, or 3·12 per cent. of those treated.

Back and spine, 326 treated, or 4·55 per cent. of the entire wounded; 45 died, or 13·49 per cent. of those treated.

Perineum, genital and urinary organs, 55 treated, or 0·76 per cent. of the entire wounded; 17 died, or 30·96 per cent. of those treated.

With direct penetration or perforation of the larger joints, 121 treated, or 1·65 per cent. of the entire wounded; 25 died, or 20·66 per cent. of those treated.

With direct injury of the larger arteries, 12 treated, or 0·16 per cent. of the total wounded; 8 died, or 66·66 per cent. of those treated.

With direct injury of the larger nerves, 22 treated, or 0·30 per cent. of the total wounded; 8 died, or 36·36 per cent. of those treated.

Sword and lance wounds, 7 treated, or 0·09 per cent. of the total wounded; 1 died, or 14·28 per cent. of those treated.

Bayonet wounds, 36 treated, or 0·50 per cent. of the total wounded; 4 died, or 11·11 per cent. of those treated.

Miscellaneous wounds received in action, 126 treated, or 1·62 per cent. of the total wounded; 6 died, or 4·76 per cent. of those treated.

RETURN OF CASES *landed at Gravesend from the* 31*st March*, 1859, *to* 30*th June*, 1859.

Classification and Specification of Wounds and Injuries.	Landed at Gravesend.	Discharged to Duty.	Discharged to Modified Duty.	Invalided.	Died.	Remaining undisposed.
1. Gunshot Wounds of the Head:—						
1. Contusions and simple flesh-wounds.						
2. With contusion or fracture of the cranium,	4	2	. .	2		
3. With depression, or displacement of both tables,	2	. .	. .	2		
Total,	6	2	. .	4		
2. Gunshot Wounds of the Face:—						
2. Penetrating, perforating, or lacerating the bony structures, without lesion of important organs,	1	1				
3. Gunshot Wounds of the Neck:—						
1. Simple flesh contusions and wounds,	1	1				
4. Gunshot Wounds of the Chest:—						
1. Simple flesh contusions and wounds,	2	2				
2. With injury of bony or cartilaginous parietes, without lesion of contents,	1	1				
5. Perforating contents,	1	1				
Total,	4	4				
7. Gunshot Wounds and Contusions of the Perineum and Genital Organs, not being at the same time Wounds of the Perineum,	1	. .	. .	1		
8. Gunshot Wounds of the Upper Extremities:—						
1. Simple flesh contusions and wounds,	11	5	2	1	. .	3
2. With contusion and partial fracture of long bones, including fracture of the clavicle and scapula,	14	4	2	5	. .	3
4. With compound fracture of humerus,	4	. .	2	1	. .	1
,, ,, radius,	1	. .	1			
,, ,, ulna,	2	2				
5. Penetrating, perforating, or lacerating the several structures of the carpus and metacarpus,	2	. .	2			
6. Dividing or lacerating the several structures of the carpus and metacarpus,	1	1				
Total,	35	12	9	7	. .	7

Classification and Specification of Wounds and Injuries.	Landed at Gravesend.	Discharged to Duty.	Discharged to Modified Duty.	Invalided.	Died.	Remaining undisposed.
9. Gunshot Wounds of the Lower Extremities:—						
1. Simple flesh contusions and wounds, .	22	10	1	3	. .	8
2. With contusion and partial fracture of long bones, or of the bones of the pelvis, in their relation to the lower extremities, ...	14	2	1	3	. .	8
3. With fracture of long bones by contusion from round shot, ...	2	. .	1	1		
4. With compound fracture of femur, . .	4	. .	. .	4		
,, ,, tibia only,	1	. .	. .	1		
5. Penetrating, perforating, or lacerating the several structures of the tarsus and metatarsus, ...	2	1	. .	1		
Total, . . .	45	13	3	13	. .	16
11. Gunshot Wounds with direct penetration or perforation of the larger joints, . . .	2	. .	. .	2		
12. Gunshot Wounds with direct injury of the larger nerves, not being at the same time cases of compound fracture, ...	2	1	. .	. .	. .	1
13. Sword and Lance Wounds, ...	23	3	3	8	. .	9
15. Miscellaneous Wounds, ...	2	2				
Total Wounds received in Action, ...	122	39	15	35	. .	33

RETURN *of Capital Operations.*

Description of Operation.	Landed at Gravesend.	Discharged to Duty.	Discharged to Modified Duty.	Invalided.	Died.	Remaining undisposed.
AMPUTATIONS.						
Upper extremity.						
Arm, ...	4	. .	. .	4		
Forearm, ...	1	. .	. .	1		
Thumbs, ...	1	. .	1			
Fingers, ...	7	. .	4	2	. .	1
Lower Extremity.						
Thigh, at middle, ...	3	. .	. .	3		
Leg, ...	1	. .	. .	. .	. .	1
Toes, ...	1	. .	1			
Amputations, since March 31, 1859, ...	18	. .	6	10	. .	2

Summary.

	Landed at Gravesend.	Discharged to Duty.	Discharged to Modified Duty.	Invalided.	Died.	Remaining undisposed.
Amputations, since March 31, 1859, ...	18	. .	6	10	. .	2
Wounded, since March 31, 1859, ...	122	39	15	35	. .	33
Total wounded, since March 31, 1859, ...	140	39	21	45	. .	35
Total wounded previous to March 31, 1859, .	603	193	67	263	7	73
Total landed at Gravesend, up to June 30, 1859,	743	232	88	308	7	108

It is probable that, for the next twelve months or more, a few men may still be coming home from India, viz., those who were only slightly wounded and had been sent to duty, and subsequently invalided either for the wound or for disease; but nearly all must have now arrived.

The greater number of the cases under the different divisions are of such a slight nature that they do not require notice.

Class I.—Gunshot Wounds of the Head.

2 cases of depression and displacement of both tables of the skull were invalided, on account of giddiness and inability to stand the heat of the sun.

Class IV.—Gunshot Wounds of the Chest.

There is one case where the ball seems to have hit the sternum and to have dropped off, although the document states that the ball entered the left side, and still remains in the cavity of the chest. Great dyspnœa followed; bubbles of air were forced through the wound, and blood in considerable quantity was brought up by fits of coughing. Has been sent to duty.

In the following case the ball perforated the lung; the patient recovered, and has been sent to duty.

Private Thomas Powell, aged 27, 9th Lancers; was wounded September 14, 1857, by a bullet, which entered the right side of the chest, 1½ inches below the sternal extremity of the clavicle, and passed out over the centre of the body of the right scapula, passing between first and second ribs; several fragments of bone came away from the front wound. The man says violent inflammation of the lungs followed.

June 7, 1859. Wounds soundly healed, but right side hardly expands so much as left; health seems good. Sent to duty.

Class VII.

1 man was admitted under this head. He was wounded on the 13th September, 1857, at Delhi, by a fragment of a shell. The posterior part of the scrotum was torn away, and the testicles, which were laid bare, subsequently sloughed.

April 27, 1859. Complains of pain in back when he walks far, and has difficulty in retaining his urine, especially at night. The right cord can be felt, but ends abruptly. A fragment of the left testicle, about the size of a hazel-nut, can be felt attached to the left cord. Invalided.

Class VIII.—Gunshot Wounds of the Upper Extremities.

The cases of compound fracture of the humerus, of the radius, and of the ulna were soundly healed, and the patients had good useful arms.

Class IX.—Gunshot Wounds of the Lower Extremities.

Division III.—*With Fracture of Long Bones by contusion of Round Shot.*

2 cases of simple fracture of the long bones of the lower extremity were admitted. One man received a contusion from a spent round shot, on the 5th May, 1858, which fractured the lower third of the right femur, but inflicted no wound: a simple fracture. The limb is now quite good, but $1\frac{1}{2}$ inch shorter than its fellow. Invalided April, 1859.

In the other case, a spent cannon-ball struck the right leg, a little above the centre of the right shin, fracturing both tibia and fibula; skin not broken. There is now slight irregularity of the tibia, and the limb is somewhat wasted, but is straight and in a good position. Shortening of limb to the extent of about an inch; rigidity of ankle-joint. Invalided April, 1859.

Division IV.—*Compound comminuted Fractures of the Femur.*

4 cases have been admitted since March, 1859, of which the following are the detailed histories:—

In the first case, it is impossible at the present time, now nineteen months after the injury, for a surgeon to say whether immediate amputation ought to have been performed, but it appears to testify to the great advantages and superiority of the

dooley over every other means of conveyance for cases of gunshot fracture of the femur; as there can be no question that this patient could not have survived such repeated removals by any other method of conveyance.

1st Battn. 8th Regt.—Private William Cunningham, aged 31, on the 14th September, 1857, at Delhi, in the trenches, received a gunshot comminuted fracture of the left femur; the ball entered on the outer aspect, some 7½ inches below the trochanter, and has never been found. He states that he was at once placed in a dooley, and the limb shortly after put up in a long splint; was twice moved to different houses which were set apart as hospitals at Delhi, and at the expiration of three months he was sent to Umballa in a dooley, a distance of eleven days' march, without any splint, the bone still ununited; and, according to the patient's statement, the splint never was replaced. The upper fragment of the femur projected in front, and protruded through the integuments, and a portion came away by necrosis; extensive abscesses formed, and the limb was left perfectly free of any apparatus, as the patient was in such a weak and exhausted condition that it was not expected he would survive; and it was thought that he was not capable of bearing amputation of the limb. He states, that while at Umballa the fracture united, and after being there two months he was sent to the Hill Station at Landaur, in a dooley.

Fort Pitt, 27th April, 1859.—The outer fragment projects outwards and forwards, and is covered by integuments; the limb is 4¾ inches shorter than the opposite one; the toes are pointed downwards, and the limb wasted. There is an open sinus at the seat of the fracture, which extends deep below the fragments, although bare bone cannot be felt. The knee-joint is stiff, and the ligamentous structure rigid from want of use; but the leg is in a straight position.

20th May.—The sinus has healed, and the patient can bear his weight upon the limb. He has been fitted with a high-heeled boot with a long thigh-piece, &c., attached, by means of which apparatus he is able to walk tolerably well, with the assistance of a stick. Invalided May, 1859.

53rd Regt.—Private Samuel Shaw, aged 36, was wounded February 3, 1858, near Lucknow, by a musket-ball, which entered the outer side of left thigh, about 4 inches above the knee, fractured the femur, made its exit on the inner side, and then entered the opposite thigh, whence it was removed by incision from near the patella.

May, 1859.—Left thigh 1½ inch shorter than the opposite,

and much atrophied, with two cicatrices adherent to the bone; the wound has only very lately healed, and the knee is stiff; he has a very useful limb, and is able to walk well with a high-heeled shoe. Invalided 13th June, 1859.

1st Battn. 24th Regt.—Private George Williams, aged 29; ten years' service; wounded at Umritzir on the 18th October, 1857, by a musket-ball, which entered the right groin a little external to the vessels, and came out just posterior to the great trochanter, fracturing the femur; many fragments of bone came away from the opening.

June, 1859.—Aperture of entrance and exit healed, but leg shortened $1\frac{1}{2}$ inches; a sinus exists on the outer side of the hip, leading down to diseased bone; has just recovered from an attack of erysipelas of this thigh; the right leg is $1\frac{1}{2}$ inches shortened; there is every prospect of the patient having a very good and useful limb; is able to walk about upon it, with the assistance of a stick. Invalided 29th June, 1859.

86th Regt.—Private J. Curtis, aged 35; fourteen years' service; wounded November 23, 1857, at Mendeswor, by a musket-ball, which entered three inches below, and a little internal to the anterior superior spinous process of the ilium, and made exit over the trochanter.

June 28, 1859. Fracture of the left femur at its upper third; bone united; limb $3\frac{1}{4}$ inches shortened; some loose, dead bone can be felt through the unhealed wound of exit; has now a very good, useful limb, and can walk well.

June 29, 1859. Invalided.

This makes 12 undoubted cases of compound comminuted fracture of the femur that have arrived in England during the whole period included in this Report. Of these, 1 died at Gravesend (Walmsley), and 1 (Cunningham) where the cure is complete, but there is considerable deformity of the limb: deducting the death, there remain 11 cases with good, useful limbs out of the total landed, viz., 743, or 1·49 per cent. This is a large proportion compared with the results of the Crimean war, viz., 8 out of 2296, or 0·34 per cent.; and if the case of Moore, which is detailed below, was returned under this head, there would be a total of 13 cases[a].

When the bones of the leg are fractured so as to require

[a] Four cases of gunshot wounds arrived from the war in Persia, all belonging to the 64th Regiment; on the termination of this war the 64th Regiment sailed for Calcutta, and formed part of the force under General Havelock in his advance on Cawnpore and Lucknow. These four cases, although actually wounded in Persia, are included in this return as from the mutiny in India; and one of them, M'Carter, is a case of compound comminuted fracture of the femur.

immediate amputation, this operation will, in all probability, have to be performed in the thigh. If, therefore, a certain number of thigh amputations are admitted, it may be inferred that the greater number had been originally wounds of the leg, and not cases of compound fracture of the femur demanding amputation.

14 amputations of the thigh have arrived from India; of which 13 are returned as in the middle third, and 1 in the upper; or 1·88 per cent. of the total 743 wounded. As stated at pages 41, 48, and 50, the success of the cases from India with this description of fracture is not to be imputed to the difference of the bullets, but to the better means at hand for treating both compound fractures of the femur and amputations. It also appears to be the better practice not to be over-anxious about the length of the limb, but rather to leave it almost entirely without splints.

In the following case there appears to be some doubt as to whether the femur was actually fractured, or whether it was only a partial fracture; although, from the direction of the ball, and the state of the limb since the injury, there is strong presumptive evidence that there was a complete fracture, either through the neck of the bone or through the trochanter, but without displacement, as now there is almost no shortening, not more, or perhaps so much, as half an inch. This man is, therefore, returned under Class IX., Division 2, but his case is detailed in this place. Of the 12 cases returned there can be no doubt that the femur was fractured.

24th Regt.—Private James Moore, aged 33, thirteen years' service, was wounded by a musket-ball on July 7, 1857, at Jhelum, which entered the left groin, about two inches below Poupart's ligament, and about two and a half inches external to the femoral artery, and passed out an inch and a half behind, and a little below the great trochanter, injuring the bone. Fragments of bone have continued at various times to come away. He has been at Gravesend since August, 1858, since which no dead bone has come away, but "he has had a pretty regular monthly accession of ague," with hepatic complication, lasting for a few days, and followed by formation of matter in the seat of the wound; and sinuses, which have re-opened, discharge for a short time, and then quite heal up, to break out again on the next disturbance of the general health. There is now considerable phlegmonous inflammation around the wound and whole of upper part of thigh, and necrosed bone exists in considerable quantity. General health good.

Class XI.—Gunshot Wounds, with direct Penetration or Perforation of the larger Joints.

Two cases were admitted, viz., one of the elbow-joint, which is now anchylosed; but the patient has a very useful hand: the other was in the knee. The following is the history of the case:—

14th Light Dragoons.—Private James Ball, aged 30, was wounded at Muddenpore Pass on 3rd March, 1858, by a musket-ball, which entered the outer side of left knee, and was cut out about two inches posteriorly. Joint primarily injured? The surgeon says, No; but the contrary seems probable. Free incisions around the joint were subsequently required. The limb can now only be flexed to a slight extent, but the joint has lateral motion in a direction inwards to middle line.

Invalided June 29, 1859.

Class XII.—Gunshot Wounds with direct Injury of the larger Nerves, not being at the same time cases of Compound Fracture.

2 were admitted, and 1 sent to duty.

42nd Regt.—Sergeant Joseph Mumford, aged 28, on March 11, 1858, received a wound from a musket-bullet (round), which entered about an inch and a half from the sternal articulation of the clavicle of right side, and was extracted from the left side of the neck behind, about the centre of the clavicle. The trachea was injured, and he spat blood for seven or eight days, and the air came out through the hole of entrance. The cervical plexus has been injured; the trachea, in the course of the wound, is tender, the opening of exit very much so, and all the fingers appear quite useless: they are fixed, apparently anchylosed in a straight position, but any attempt at bending them causes intense pain in the course of the median nerve. The hand is cold, and affected with nervous tremor; all the fingers are numb, but the motions and sensation of the thumb are good.

May, 1859. Duty. Results of wound probably not to a disqualifying extent.

Art. IV.—*Clinical History of the Eastern Division of the Royal Maternity Charity, during the Year ending September* 30, 1858[a]. By Robert Barnes, M. D., Vice-President of the Obstetrical Society of London; Honorary Member of the Dublin Obstetrical Society; Physician to the Royal Maternity Charity; Assistant Obstetric Physician to the London Hospital, &c., &c.

The important share taken by the Royal Maternity Charity in the obstetric experience of London leads me to believe that a clinical history of its proceedings during the last year will present several points of interest. For example, this experience may be expected to represent to a certain extent the parturient history of London, and thus to furnish a standard of comparison with other places. The patients being all attended at their own homes, we shall obtain the means of contrasting the relative advantages of hospital and home obstetric institutions; and several reflections and inquiries of an important social, medical, and administrative nature are suggested.

The patients of the Royal Maternity Charity are attended by a staff of midwives whose competency is certified, after instructions, by my colleague, Dr. Hall Davis. The field of its operations is divided into three Districts, an Eastern, a Western, and a Southern. Each district is placed under the superintendence of a physician, who nominates as his assistants medical practitioners, conveniently located to act for him in cases of emergency. The Eastern District, which is placed under my charge, is by far the most active. It does two-thirds of the entire work of the Institution; and constitutes, I believe, by itself the largest obstetric charity in London. In the year ending with September, 1858, 2418 deliveries took place in this division. The total registered births in all London during 1858 amounted to 88,620. Thus one labour in 36, or nearly 3 per cent. of the whole obstetric work of the metropolis, would appear to be carried out in my division of the charity. This experience is equal to, or surpasses, that of many considerable towns. It is nearly half that of such capitals as Edinburgh.

Carefully refraining from treading too far along the inviting and seemingly luminous, but most treacherous path of vital statistics, I purpose to adduce the definite numerical results of the Royal Maternity Charity in such a manner as to illustrate certain defects in our Registration system. The Registration of Births in England is not compulsory; one result of this I have elsewhere shown to be, that the Registration is not complete, not even as regards the births of living children.

[a] Read before the Dublin Obstetrical Society.

Further, as no account is taken of the births of dead children, we fail to arrive at any correct idea of the total number of deliveries; hence the public statistics upon obstetric questions are vitiated. In the first place, the returns do not represent, as it is assumed they do, the number of labours, but the number of registered live-births. Secondly, presuming that the deaths in childbed are all correctly registered, we want one element which is essential to the estimation of the proportion of deaths in childbed. Thirdly, we have no information as to the proportion that dead-born children bear to live-born. Fourthly, we have no means of investigating the causes of still-birth, a subject which a little reflection will show to be of the highest medical, social, and sanitary interest. Fifthly, the statistics, so often quoted, of illegitimate births are purely conjectural and without value.

Here I may remark, that the experience of an institution working, like the Royal Maternity Charity, over an extensive area of the town and at the homes of the patients, must give a more accurate representation of the ordinary parturient history of the community than can be drawn from the records of lying-in hospitals, where almost all things that surround the puerpera are exceptional: this difference will be borne in mind in the subsequent comparisons.

Table I.—*Illustrating the Proportion of Still-Births to Total Births*[a].

	Total Labours.	No. of Dead-born.	Proportion of Dead-born.	Dead, putrid.
Royal Maternity Charity, London, 1856-7-8,	10,561	308	1 in 34	
Maternity and Dispensary, Edinburgh, 1858,	883	62	1 in 14	
Lying-in Hospital, Dublin, 1757 to 1847,	156,100	9291	1 in 17	
Ditto, 1847 to 1854,	13,748	968	1 in 14	487
Birmingham Lying-in Hospital, 1858, . .	1049	59	1 in 18	

Table II.—*Showing Proportion of various Operations, &c., in Dublin Lying-in Hospital and Royal Maternity Charity.*

	Craniotomy.	Forceps.	Turning.	Placenta Prævia.
Dublin Hospital, 1847 to 1854,	130, or 1 in 106	200, or 1 in 69	66, or 1 in 208	24, or 1 in 571
Royal Maternity Charity, Eastern Division, Dr. Barnes, . . .	4, or 1 in 600	6, or 1 in 445	7, or 1 in 316	9, or 1 in 268

[a] The figures relating to the Edinburgh Institution were kindly supplied to me by Dr. Matthews Duncan; those from Birmingham by Dr. Elkington.

Table III.—*Illustrating Rate of Mortality in Childbirth, distinguishing Puerperal Fever, in Hospital and Home Practice.*

	Total Deliveries.	Total Deaths.	Rate of Mortality.	Deaths from Puerperal Fever.	Rate of Mortality from Puerperal Fever.
All London, 1858, . .	87734[a]	430	1 in 204	165	1 in 502
Royal Maternity Charity, Eastern Division, 1857, 1858, Dr. Barnes,	2418	7	1 in 345	4	1 in 600
All Edinburgh, 1858, .	5186[a]	28	1 in 183	16	1 in 321
Hospital, Edinburgh, . .	277	3	1 in 92	Not specified.	
Lying-in Hospital, Dublin, from 1847 to 1854,	13748	163	1 in 84	70	1 in 197
Lying-in Hospitals, London, 1858,	. . .	11			

In Table I. I have brought together illustrations of the proportion of dead-born to live-born children. In the Royal Maternity Charity one child out of every 34 is still-born; in the Maternity and Dispensary at Edinburgh 1 in 14; in the Birmingham Lying-in Hospital, including in and out patients, 1 in 18; in the Dublin Lying-in Hospital, during the first ninety years of the existence of this celebrated Institution, 1 in 17; and during the seven years from 1847 to 1854, the proportion was 1 in 14.

1. Applying these facts to the solution of the question of the unknown number of dead-born children in London, we find, taking the Royal Maternity experience, that since about 3 per cent. of the total births are dead-born, we must multiply the registered births in London by 1·03, which would give 91,278, from which, if we deduct 1 per cent. for twin-births, the number of deliveries would be 90,365. This is still liable to the fallacy that an unknown number of living children escape registration.

2. From this estimate it appears that 2658 still-births (no account taken of abortions) take place annually in London. Of these 2658 deliveries, the public has no information; that is, we know nothing of the circumstances under which 2658 women brought forth; it is not known how many were unassisted by competent skill; it is not known how many of the children thus ignored perished from causes connected with the act of delivery; it must, indeed, remain a matter of conjecture whether this number does not include many infants who

[a] Deduction from registered births of 1 per cent. made for twin births.

perished from neglect, or more criminal default, within a few hours of birth. The medical statistician is left to regret the loss of many facts that might prove of signal value as indications in preventive medicine; the statesman must contemplate with alarm an uncertain amount of social misfortune, of depravity, and of crime, that lies enveloped in mystery, and therefore beyond relief or restraint.

I refrain from pursuing this speculation through its applications to Edinburgh and Dublin, or the kingdom at large. In Ireland there is, unfortunately, at present no registration. I will merely refer to the great difference between the proportion of dead to live-born children observed in the Dublin Hospital and in London. The wide distance between 1 in 34 in London, and 1 in 14 in Dublin, may raise a doubt as to the correctness of the London returns; of the correctness of the Dublin returns there can be none. But there is a remarkable circumstance, which the admirable perfection of the records of the Dublin Hospital supplies, that throws light upon the discrepancy. A record is kept of the children born dead and *putrid*. Now the proportion of putrid children alone is 1 in 30, or greater than the total dead-born in London. There must, then, be causes in operation in Dublin which do not act in the practice of the Royal Maternity Charity. Another fact that deserves attention is, that there appears to be a relation between the proportion of dead-born children, and the proportion of obstetric operations and maternal mortality. This latter also is far higher in Dublin than in London.

The conclusion indicated by the foregoing reflections, and others that will suggest themselves is, that *an effective scheme of registration must embrace every delivery*. In the case of the fruit being still-born, it is desirable to specify, as well as can be done, the ascertained or probable cause of death. The only approach to a collection of reliable evidence upon this head with which I am acquainted was commenced by Dr. Collins, and continued under Dr. Shekleton, at the Dublin Lying-in Hospital. I have no hesitation in declaring my conviction that the extension of registration to still-births is imperatively required as a means of protection for infant and even maternal life. Of its importance as an element in the construction of medical statistical comparisons, every one accustomed to similar researches may judge. An objection, not without weight, lies in the difficulty of drawing a line between abortion and birth at a period when the fruit is viable. But I cannot now discuss objections or difficulties.

Returning to obstetrics proper, I refer to Table II., in which the proportions of various operations in the Dublin

Hospital and in the Royal Maternity Charity are stated. During the seven years from 1847 to 1854 in Dublin, craniotomy was performed once in every 106 labours; in London, once in 600 labours; the forceps was used in Dublin once in 269 cases; in London, once in 400; and turning was performed in Dublin once in 208 cases; in London, once in 345. Some reflections, bearing upon these differences, are contained in the observations that follow upon the next Table.

The Table illustrating the rate of mortality in child-birth, distinguishing deaths from puerperal fever, must be read with some reservation. Inquiries made with reference to this report increase the distrust which a peculiar experience had already raised in my mind as to the trust-worthiness of the public statistical returns. In London, owing to the vastness of the community of which the medical practitioner forms an item, instances of individual mishap in practice reflect less severely upon him than they are apt to do in more limited circles. The mortality returns of London are, moreover, subjected weekly to the scrutiny of the medical officers of health. Coroners' inquests are also freely held in cases of death, the cause of which is not satisfactorily attested. The Registrar-General publishes weekly a summary of the London mortality returns, which is scanned with interest by many persons. These circumstances concur to invest the London mortality returns with an authority which I fear is not merited generally. The fallacy of large generalizations, unchecked by individual experience, may be seen from the following example:—It is stated in the Registrar-General's Report for 1856, that the mortality in child-birth in England and Wales, in 1847, was 1 in 167, and that it had fallen to 1 in 227 in 1856. Now, having applied to Dr. Elkington for the puerperal statistics of Birmingham, I learn that the Registrar of that town says that "no one ever specifies the deaths in child-bed or from puerperal fever." May it not be that in 1847 there was less repugnance in giving correct certificates than in 1856? Certain it is, that here, as in every other medical inquiry, we must fall back upon individual observation.

MORTALITY IN CHILD BIRTH.

The facts tabulated cannot fail to provoke the important inquiry as to the relative advantages of hospital and home obstetric institutions. When we observe that in hospital practice 1 woman in 92 dies in child-bed in Edinburgh, 1 in 84 in Dublin, whilst in the Royal Maternity Charity the deaths were only 1 in 345, the causes of this difference must appear deserving of investigation. I at once discard all idea of difference of

skill. The indications for operations are much the same in London and Dublin; at least they are so for me. The following causes appear to be the most efficient:—

1. Puerperal fever is undoubtedly more destructive wherever lying-in women are congregated. By congregation, the fomites given off acquire concentration, and probably tend to that specific fermentation which produces the poison so fatal when absorbed into the circulation. In addition to the greater risk of aërial infection, there is the increased danger in hospitals of conveying poison by touch, and by articles of clothing. The state of insulation of every puerpera in her own dwelling guards her from the most active sources of infection. The difference in London is striking. Whilst the 2418 home-patients gave only 7 deaths from all causes, no less than 11 women died in the hospitals, most of them probably from fever, although the total deliveries were far less in number.

2. The late period of the labour, and comparatively helpless condition of the patients when brought into hospital, contributes largely to the mortality. In home practice, we have the advantage of watching the patient from the commencement of labour; her condition is not imperilled by being transported at a critical period to a distance. The records of the Dublin Hospital show that many women are brought in moribund, and many others too late for the application of the most effective means of treatment.

3. The deserved reputation of the Dublin Lying-in Hospital attracts many of the most formidable obstetric cases, so that the practice of such an institution includes a higher proportion of dangerous cases than would occur in the general population. I must observe, that to a certain extent the Royal Maternity Charity is entitled to the like consideration. The knowledge that the physician will be called in, in the event of difficulty, induces women who have previously had bad labours to apply for tickets. This circumstance, then, I do not think will account for the far greater proportion of operation cases in the Dublin Hospital. Thus, during Dr. Shekleton's seven years' mastership, 1 woman in 42 was delivered by forceps or craniotomy, whilst, in my public practice, only 1 women in 420 was thus delivered. This excess of 10 to 1 must have other causes concurring. Is it that distortion is more common in Ireland? This and other questions suggested increase the regret that a system of registration, like that in operation in England, is not yet established in Ireland. We cannot know how far the experience of the Dublin Hospital is exceptional or typical of the parturient history of Ireland, until we have a general statistical return.

4. I may be excused for adverting to a doubt which has been often expressed to me, whether the records of the Royal Maternity Charity are so accurately kept as to deserve reliance. I believe the system followed is well calculated to insure completeness. Every month each midwife presents her case-book to the secretary; in this, entry is made of the name, residence, date of delivery, nature of presentation, fate of mother and child of every case attended by her, and also of every case in which the assistance of the physician has been called in. She is bound to visit every patient at least three times after delivery, and to enter the dates of her visits. In my Division, the midwives' reports are checked by my own case-book, and by returns made to me by my assistants. It must further be remembered, that any midwife neglecting to call assistance in a serious case runs the imminent—almost certain—risk of a coroner's inquest; and that the Registration system would surely bring to light any case of puerperal death. As far as they go, I believe no serious errors exist in the statistics I have given. It should be mentioned, that the Royal Maternity Charity gives relief to married women only.

The experience of the Dublin Lying-in Hospital, where it is certain that every important circumstance is faithfully recorded, is therefore entitled to a degree of confidence to which no public vital statistics can lay claim.

These reflections again lead me to the conclusion that no thoroughly reliable public vital statistics will ever be collected until it becomes imperative upon every person assisting at a birth, whether the fruit be living or dead, to see that the birth is registered.

I am not competent to determine how far the system of home delivery is capable of being extended in Dublin. It is possible that any curtailment of the hospital succour would be attended by an increase of suffering greater than that which might be abrogated by succour at the homes of the poor. But it is impossible to read the histories of many of the cases brought to hospital, and not to perceive that lives have been frequently imperilled and lost, because the labours were not concluded where they had begun. In England, I believe, the extension of hospital obstetric practice is on every ground to be deprecated. Independently of the great mortality of lying-in hospitals, there are motives of the highest moral, social, and even national importance, that should induce us to resolutely withstand any approach to the system in operation in Continental cities.

Leaving these general reflections and comparisons, I will now relate the clinical history of the Royal Maternity Charity.

The various orders of cases are ranged under heads, and brief remarks are appended. In this place it will be convenient to enumerate the fatal cases. One woman (No. 37) died of phthisis; she was in the last stage at the period of labour. 3 died of puerperal fever. 1 died of pneumonia. 1, whose case is not related here, is returned as having died of "exhaustion, foot-presentation;" this case occurred before I had entered upon the duties of the office. 1 death took place from convulsions, before assistance could be obtained. Not a single death took place in consequence of any operation.

The cases of placenta prævia, being embodied in a special communication read before the Obstetrical Society of London, are not reproduced.

CASES OF CRANIOTOMY.

Distorted and Contracted Pelvis; Craniotomy.—No. 11. November 10, 1857.—Second labour; delivered of her first child by craniotomy. She was taken in labour on the 9th, at 3 P. M. The membranes ruptured the same night; feeble pains continued all day. I saw her at 10 P. M. on the 10th; pains, hardly any; pelvis so contracted at outlet that two fingers were introduced with difficulty; arch of pubes also contracted; sacrum projected, and pubes so pressed back as to reduce antero-posterior diameter to three inches. She has a strong spinal curvature, and, when standing, one side of the pelvis is lower than the other. The pelvis is twisted laterally, and the cavity shortened. Head in first position, but lying on the pubes; full size, bones hard. Perforated. I was obliged to break up the head, bringing away the bones piecemeal by crotchet and craniotomy forceps before the base could be brought into the pelvis. After considerable labour, the child was extracted. A copious gush of hemorrhage followed the placenta. She recovered quickly and perfectly.

Contracted Pelvis; Craniotomy.—No. 24. February 2, 1858. Pluripara; always lingering labours; last child still-born. At full term; seen by Mr. Edmunds, one of my assistants, at 10 P. M. on 1st; head at brim; already in labour some hours, without progress. I saw her at 3 A. M.; the pains had remitted. Patient weak and restless; pulse small. Sacral promontory easily reached by finger; antero-posterior diameter scarcely exceeding three inches; cranial bones overlapping, and skull somewhat flattened between promontory and pubes, but still movable, as the full diameter of the head is too large to enter. Some contractile nisus having returned, I waited an hour; but this being ineffectual, and symptoms of exhaustion increasing, I lessened the head, and delivered by crotchet. The moment

the head was lessened, contraction returned strongly. Recovered favourably.

February 15, 1859. Again in labour at full time; head and foot presenting. The contraction of antero-posterior diameter forbidding application of forceps, I determined to try extraction by turning, before lessening the head. This was done under chloroform. The head was jammed for twenty minutes between the promontory and pubes before it could be dragged through. Great force was used; the head slipped into pelvis with a sudden jerk. Child born asphyxiated, but in a few minutes recovered. Mother and child both did well.

Contracted and Distorted Pelvis; Craniotomy.—No. 29. February 12, 1858.—Primipara, aged 20. I saw her at 3·15 A.M. The membranes had broken on the previous day. She had strong pains, but no advance for some hours; pains now flagging. Has been lame in right leg from birth. Pelvis narrow in pubic arch; promontory somewhat projecting; brim slightly oblique, ovate. Head in first position, movable; but pains do not drive it into brim. Some febrile movement and mental excitement. Lessened the head; the bones broke up so easily that it was difficult to get a hold with the crotchet. Pains returned, and head extracted in 90 minutes. Recovered well.

February 9, 1859. She was again in labour at full time, having disregarded injunction as to induction of premature delivery. Violent pains, of several hours' duration, ineffectual. Patient highly excited, delirious. Gave chloroform, and delivered by forceps, using strong *compression* with contraction. In half an hour brought head through; it bore deep impressions of fenestræ. It was a male, and small, and lived. The mother had mania, but recovered in St. Luke's Hospital.

Contracted Pelvis; Hydrocephalus; Craniotomy.—No. 70. September 2, 1858.—Second labour; first child still-born. In labour since yesterday. At first, midwife "could feel no presentation." Membranes broke last night; pains strong all through. Great nervous excitement; face flushed; pulse quick; skin hot. Head in first position; felt as a broad expanse lying like a globe on a brim too large to enter; sutures widely open; pelvis somewhat contracted. Forceps could not be applied. Perforated; a free gush of water and cerebral matter followed. Extracted by crotchet and Dr. Oldham's vertebral hook, with some difficulty, in an hour. Child large. Patient did well.

Notwithstanding the favourable result to mother and child in Nos. 29 and 24, of substituting turning and the forceps for craniotomy in contracted pelvis, I am far from wishing to submit these cases as examples for general imitation. They concur

with the experience of others in proving that there are certain cases, where the disproportion is not great, in which the alternative is open to us. To determine which method is the more judicious in any particular case must be always left to the judgment of the practitioner, who alone is in a position to estimate fairly all the circumstances.

Contracted Pelvis; Induction of Premature Labour.—No. 63. July 27, 1858.—Has had four labours; first, craniotomy; second, "instrumental," child still-born; third and fourth, induced at seven months and a half by douche; one of the children now alive. Pelvis very contracted, with narrowing of pubic arch. Labour induced in thirty-fourth week, by repeated injections of tepid water against the os. Child alive. Recovered well.

CASES OF TURNING.

Arm and Funis Presentation (Placenta Prævia); Turning.—No. 18. December 16, 1857.—Labour at eighth month. Foot lay near os, so that it was seized without passing hand through. The passage of the body was very tedious, owing to rigidity of the os. Child still-born. Mother did well.

Arm and Funis Presentation; Turning.—No. 20. December 23, 1857.—A strong, muscular woman, in third labour, full time; in second labour a breech presentation. Waters escaped at 10 P. M. on 22nd; pains remitted for some hours, when I saw her at 4·30 P. M. on the 23rd. The left fore-arm then protruded from vagina, palm directed to right thigh; also a large bunch of funis in vagina lying in front of arm; os fully expanded; uterus firmly contracted on body of child; the head lay over pubes, a little to left; the shoulder was jammed into the brim. Gave chloroform. The first inhalations caused nausea and strong expulsive pains. When breathing became sonorous, I passed my left hand into the uterus, but this excited stronger contractions than the same manipulation before chloroform. The inhalation being kept up, the excitability of the uterus was lessened. The furthest knee was brought down, and evolution effected. The pains returned, so that traction was no longer necessary. The child (male, and of large size) was expelled in twenty minutes from commencement of operation. It was born slightly livid; heart beating feebly; respiration inexcitable; Marshall Hall's method ineffectual. The placenta was very large; the cord was inserted an inch and a half from the margin; the rent in membranes was three inches from same margin. The patient recovered favourably.

This case is an illustration of the position of Levret, that a

low implantation of the placenta near the cervix is a cause of transverse presentation.

Arm Presentation; Turning.—No. 23. January 18, 1858.—Pluripara, full time. Membranes broke at noon yesterday. I saw her at 7·30 P. M. on the 18th. Arm had been down twenty-four hours; pains had remitted some hours. Woman robust, not much prostrated. I found the right hand presenting, thumb to pubes. The shoulder was jammed into the brim; uterus compressing body tightly, all liquor amnii having drained away; child still alive. I did not give chloroform. Passed my left hand into uterus with some difficulty, but no excessive contraction was excited by the operation. The uterus was so tonically contracted round the body that I found it impossible, without using excessive force, to reach the farthest knee; the nearest one was accordingly brought down. When the breech was at the brim, pains returned, and effected expulsion. The cord became compressed, and the child—a large one—was still-born. The rent in the membranes was nearly central. Patient recovered well.

Arm Presentation; Turning.—No. 25. February 2, 1858.—Pluripara; once before delivered by turning. I saw her at 1 P. M. The hand had been down since 11 P. M. of 1st; the membranes had ruptured at noon; pains had remitted some hours. Patient anemic, weak. The left hand was presenting, thumb to pubes. Omitting chloroform, I passed my left hand. The shoulder was very low, and head lay over pubes; uterus compressing child into a ball. The passage of the hand was difficult, but it excited no contraction. The farthest knee could not be reached without undue violence; the nearest was brought down. Contraction returned when evolution was effected, but was strengthened much by occasional doses of brandy. Expulsion was effected mainly by uterus, aided by pressure externally. Pulsation in cord ceased when breech was engaged in brim. Child still-born. Considerable hemorrhage followed, and a clot weighing about 2 lbs. was expelled. The rent in the membranes was two inches from the edge, and the cord was inserted close to same edge. The woman was much exhausted by the labour, but recovered favourably. This case is also in illustration of Levret's proposition.

Twins; Pendulous Uterus; Turning.—No. 57. July 21, 1858.—Pluripara. Membranes broke at 8 P. M.; labour very lingering, though the pains were good; breech presenting. The uterus was of enormous size, and hanging over the pubes. Owing to this mal-direction, to distention, and to the loss of power from transmission through double sac of liquor amnii, contractions were ineffectual. I delivered presenting child by

hooking down one leg; male, living. Second child presented by head, forehead to pubes. I ruptured membranes; pains strong, but no expulsive effect; head too high up and lying too forward over pubes to admit of convenient application of forceps. Introduced left hand to turn; found knee in anterior aspect in front of pubes. Brought it down; but though traction was exerted directly in posterior direction, the head, being hitched in front of pubes, would not turn. I therefore passed hand in again, and, seizing head, pushed it up, whilst traction was kept up on leg, and abdomen supported externally. Evolution now took place, and labour was easily accomplished. The second child was still-born; both were of average size. Placentæ adhered to fundus, very large, and slightly united;

Fig. 1.

were extracted. Fig. 1 illustrates the retort-form of uterus, and position of the children, in this case.

The midwife not inaptly compared the operation of delivering the second child to "lifting it over a wall," so completely did it lie in a bag in front of the pubes.

In addition to the above, Mr. Greenwood performed version in one case on account of arm presentation. Child still-born; mother did well.

Turning for Placenta Prævia.—No. 35. April 12, 1858.—The child, a seven months', was born alive, and survived. Mother did well.

Turning for Placenta Prævia.—No. 59. June 10, 1858.—The child, a seven months', was born alive, and survived. Mother did well.

See also No. 45, under "Puerperal Fever."

It will be observed that the only death consequent on turning was No. 45, in whom the operation was performed for placenta prævia. Puerperal fever ensued, and death followed eight days after delivery. It is possible that in this case contagion was concerned, since the midwife had other cases of fever about the time.

But I think it important to advert to a fact I have dwelt upon elsewhere, namely, that patients with placenta prævia are more liable than others to have uterine inflammation and pyemia, on account of the great vascular development of the structures through which the child has to be extruded. This danger is infinitely increased when the hand is forced through the os uteri, and the child withdrawn. The greater amount of compression and contusion of the cervix, of course, adds to the risk of inflammation and absorption of putrilage. It should also be borne in mind that the os and the cervix, thus exposing a rough "amputated" surface, from which the placenta has been detached, and thus bruised and inflamed, are in free contact with the external air, in the most favourable condition for suppuration and putrefaction of discharges. Under ordinary circumstances the part of the uterus to which the placenta had grown is protected from these influences. Gendrin has pointedly adverted to this source of danger. Dr. Radford has, I believe, shown that puerperal fever is more frequent after turning; and I find, that out of the 24 cases of placenta prævia narrated by Drs. Sinclair and Johnston, 2 certainly, and probably 3, died of phlebitis. To this I have to add another case which occurred to myself in April last. The patient died of inflammation of the uterus eight days after delivery by turning.

These facts must weigh in our estimate of the methods of treating placenta prævia. Any method which either averts

the necessity for turning, or allows us to wait until the structures are so dilated as to render the operation less violent, deserves increased consideration on this account.

It will, perhaps, be noticed that chloroform was given in only one case of turning. In that case, as in others within my experience, it did not facilitate the operation. It not uncommonly happens that the excito-motory function is so heightened by anæsthesia that the presence of the hand causes violent contractions of the uterus. By pushing the anæsthesia further, this may, it is true, be overcome; but without skilled assistance to administer the chloroform, this cannot be safely done. I find in Drs. Sinclair and Johnston's book a similar case, where chloroform obstructed version. I am satisfied that I can in most cases pass the hand into the uterus, and perform any necessary operation there, with less irritation and more facility, without inducing anæsthesia.

CASES OF FORCEPS DELIVERY.

Lingering Labour; Forceps; Paralysis of Leg.—No. 66. August 6, 1858.—Tenth pregnancy; in labour twenty hours; head partly in pelvis, in left oblique diameter, but no progress, notwithstanding pains. Applied forceps; a little traction brought head fairly into pelvis, and then pains expelled it. Child lived. On the 10th, the mother suffered from paralysis of the left leg, with great pain in the hip-joint. She had complained much of cramp, and pain in left pelvis during birth of head. There had, no doubt, been excessive pressure on left sacral plexus. These symptoms persisted for some weeks.

Contracted Pelvis; Convulsions; Forceps.—No. 67. August 6, 1858.—Primipara, aged 35; many hours in labour; point of cone in pelvis; very large caput succedaneum; sutures overlapping; scanty room for finger in any part of circumference except under right acetabulum and left sacro-iliac synchondrosis; head in right oblique diameter. Pains strong, suffering acute, face flushed, eyes injected. Contrary to advice of a more discreet colleague, the midwife in attendance had given ergot, instead of sending to me earlier. Although it seemed doubtful whether the head would pass without lessening it, I tried forceps; with these, using considerable extracting force, I delivered in an hour. Before delivery a convulsive fit, with stertor and insensibility, occurred, which seemed to be excited by uterine contraction and pain. Child still-born; mother did well. I regretted that I could not administer chloroform, which, from experience in

like cases, I have found efficacious in averting convulsions and facilitating labour.

Face to Pubes; Forceps; Adhesion of Placenta; Calcareous Degeneration.—No. 47. May 27, 1858.—A strong woman, in labour with twelfth child. Labour lingering, but still pains; face to pubes. In order to shorten labour, delivered immediately by forceps. Child alive.

Being summoned elsewhere, removal of placenta was left to midwife, but I was called back in two hours on account of retention of placenta and flooding. There was irregular saccular contraction; the greater part of placenta had to be peeled off by fingers. This removed, hemorrhage ceased. The uterine surface of the placenta presented patches of calcareous degeneration. Smart bronchitis, peritonitis, and fever followed. She recovered favourably.

Powerless Labour; Forceps.—No. 69. August 24, 1858.—Eighth pregnancy; in labour since yesterday. Midwife ruptured membranes at 4 A. M. on 24th; no pains "to speak of" at 9·30 A. M., when I found head in left oblique diameter, at brim; os fully dilated. Applied forceps; gentle traction was followed by uterine contraction, and labour was completed in twenty minutes. Child male, large, livid, but breathed freely soon. Hemorrhage, restrained by pressure, followed. Recovered well.

Difficult Labour; Forceps.—No. 60. July 23, 1858.—Primipara; head said to have been three hours at brim; strong pains, but no progress; slight disproportion. Applied forceps; exerted considerable tractile force, aiding pains, during more than half an hour, when head, elongated and cylindriform, was extracted. Child still-born. Mother recovered well.

Pendulous Belly; Protracted Labour; Forceps.—No. 65. August 2, 1858.—Third pregnancy; membranes broke two days before; head has presented several hours, with strong pains, but no progress. Belly very pendulous, so that child lies in a curve over the pubes; head nearly wholly in cavity. Pains quite inefficacious, from false direction of expelling force, which is wasted against the pubes. Applied forceps; as soon as head was moved, a considerable quantity of liquor amnii escaped, which had been ponded up in the sacculated uterus in front of pubes. Gentle traction, with upward pressure on abdomen externally, soon completed delivery. Child still-born; no pulsation in cord; respiration inexcitable; Marshall Hall's method tried for ten minutes without effect.

Fig. 2 exhibits the retort-disposition of the uterus in this case.

Fig. 2.

The forceps employed in the foregoing cases is the instrument in use at the Dublin Lying-in Hospital.

CASES OF PUERPERAL FEVER.

Puerperal Fever ; Phlegmasia dolens.—No. 30. February 28, 1858. Pluripara; delivered 16th inst.—Complained of violent pains "all over her," and shortness of breath on the 27th. Great fever; depression; left leg somewhat swollen; acute pain on attempting to move it, and on pressure in groin (she had complained of pain in left iliac region and leg before delivery). Ordered bark, ammonia, and chloric ether. On March

7th the left leg was better, but the right leg was affected. 12th. Both legs free, fever subsided, but prostration. She ultimately did well. It was a very unpromising case at first. She had been going on favourably till the 26th, when she had a fright from seeing a child swallow a pin. She had white swelling of the left leg in a previous labour.

Fever.—No. 36. April 16, 1858.—A pluripara; had considerable fever. Habitat, a close, unhealthy court; room ill-ventilated; infected with privy stench. Recovered.

Fever.—No. 38. May 10, 1858.—A Jewess; primipara; had considerable fever after labour, with abdominal pain. Recovered under bark and salines.

Puerperal Fever.—No. 12. November 14, 1857.—Natural labour; living child. Had shivering and vomiting same day, and again at night and following day. I saw her on the 16th. Pulse 124; tongue brown, but moist; abdomen painful on pressure; tympanitis. No lochial discharge or milk. She had gray powder and Dover's powder, of each five grains every four hours, and a mixture of liquor cinchonæ and ammonia, and mustard poultices. On the 17th she was better. There was a scanty secretion of milk and lochial discharge. On the 22nd, having apparently fairly recovered, she was seized with dysentery, acute pain in the descending colon, fever, and prostration. She took infusion of cusparia, nitric acid, and tincture of opium with great relief, and recovered.

Puerperal Fever; Death.—No. 27. February 7, 1858.—A Dutch Jewess; pluripara; delivered three days. When I saw her, there was fever, prostration, rapid, small pulse, respiration hurried, tongue brown at back, red at edge; countenance anxious; no abdominal pains, even on pressure; had passed "thirteen or fourteen" stools in twenty-four hours; no milk; lochia not suppressed. Ordered cusparia, nitric acid, and laudanum; and Dover's powder with gray powder at night. (Habitat, a small, crowded room, without back window.) On the next day diarrhœa had stopped, but she was not better: bark, ammonia, chloric ether, beef-tea, wine. 9th. Great pain, redness, and swelling of left elbow and fore-arm. 10th. Same condition of right leg. 11th. Vesications on right leg. 12th. Both arms and legs affected, and a gangrenous sore on sacrum, on which she had rested. 13th. Died.

Inflammation of Uterus and Peritoneum.—No. 13. December 5, 1857.—A pluripara, delivered naturally of a living child. Nineteen days after labour she was seized with acute pain in left iliac region, which spread over abdomen, and there was considerable febrile movement. She was quickly relieved by

salines, Dover's powder, and mustard poultices. On the 9th she was convalescent. Recovered.

Inflammation of Uterus and Peritoneum.—No. 14. December 4, 1857.—Delivered of seventh child five days ago. Third day she had shivering; fourth, arrest of lochia and milk; partial suppression of urine; constipation; acute fever; pulse 110; tongue white; acute pain in left iliac region, and pain on pressure all over the abdomen, which is tympanitic; also slight bronchitis. Under salines, Dover's powder, and mustard poultices, she was relieved, and recovered.

Placenta Prævia; Turning; Puerperal Fever; Death.—No. 45. May 21, 1858.—A pluripara, delivered on the 19th by Mr. Edmunds, by turning, on account of placenta prævia. Next day, fever, tympanitis, and prostration. (Habitat, not confined, well aërated.) 21st. Tenderness in left iliac fossa. 22nd, 23rd, 24th. Diarrhœa; irregular, intermitting pulse; pain increased. She sank on the 27th.

Puerperal Fever.—No. 51. June 13, 1858.—Delivered naturally of a living child on the 12th. Next day, delirium, fever, acute pain in belly. 13th. Delirium and pain worse; improved till the 16th, when pain returned, with retching and diarrhœa. Took cusparia, nitric acid, and laudanum. On the 20th, convalescent. (Habitat, a close, small room, intensely hot.)

Puerperal Peritonitis; Death.—No. 55. July 18, 1858.—Delivered six days; in great misery; lochia and milk scanty; diarrhœa; great pain in abdomen; for two days seemed better. 23rd. Symptoms aggravated. 24th. More prostrated; syncopal seizures; vomited "matter like a motion;" tympanitis. She sank on the 27th. The midwife who attended this woman had two other fatal cases of puerperal fever in her private practice about the same time. I advised her to intermit her practice for a while. When she returned to duty no fresh case occurred.

Puerperal Fever; Diarrhœa.—No. 16. December 9, 1857.—Pluripara; delivered 8th. Seized next day with violent pains in back; acute pain in abdomen, and especially in right iliac region on pressure; fever; pulse 110; tongue dry; milk and lochia scanty; frequent watery stools. Had calomel, one grain, and Dover's powder, five grains, every four hours. On the 10th diarrhœa and pain had abated. Ordered infusion of cusparia, nitric acid, and laudanum. On the 12th, still improving, but diarrhœal tendency remains. On the 16th, convalescent. Recovered.

Puerperal Fever.—No. 28. February 13, 1858.—A pluri-

para. Taken with considerable febrile movement, with nervous excitement, three days after delivery. (Habitat, a small, close room, without back opening, and air rendered more stifling by shutting in the bed with curtains.) She was ill for some days, but recovered.

Peritonitis; Diarrhœa.—No. 58. July 23, 1858.—Pluripara; delivered of twins, both living, on 15th; rapid labour; no hemorrhage. Taken on following day with abdominal pain and diarrhœa. This still continued on 23rd. Ordered, liquor of acetate of ammonia, with five grains of Dover's powder, every four hours. 24th. Better. Recovered favourably. This patient was attended by same midwife as No. 55.

In addition to the above, a woman was seized in September, 1858, with peritonitis, five or six days after labour, from going about too soon. She was found in great wretchedness, was badly nursed, and died on the 16th. This case was attended in my absence by Mr. Lane.

In this history I omit several cases of minor severity, the particulars of which present no sufficient interest to justify relation.

The following cases do not require classification:—

Protracted Labour; child weighing twelve pounds.—No. 56. July 20, 1858.—A robust Irishwoman, who had three difficult labours. In labour twenty-eight hours; progress very slow; head expelled naturally; uterus was powerless to expel shoulders; child still-born. Placenta did not correspond in size with the child. Patient had some fever, and vomiting next day, but recovered well.

Retained Placenta; Partial Calcareous Degeneration; Irregular Contraction.—No. 43. May 14, 1858.—Pluripara; feeble; ill-nourished; delivered by midwife; funis and hand presentation; placenta retained, with considerable hemorrhage. The placenta was shut in by rigid contraction at the os internum. This was overcome by steady pressure. Placenta removed; hemorrhage ceased. The uterine surface showed generally spots of calcareous degeneration, but there had been no adhesion.

My assistants return several cases of retained or "adherent" placenta. I record this case for the purpose of suggesting that a particular inspection of the placenta should be made in all cases of retained and adherent placenta. In some cases I have found evidences of inflammation of the decidual portion of the placenta. A frequent condition is calcareous degeneration of the decidual surface. This is exemplified in No. 47, under "Forceps Deliveries." The exact seat of attachment of the

placenta should also be noted. I have observed that a low implantation, where the placenta encroaches upon the lower or cervical zone of the uterus, disposes to adhesion and retention.

Convulsions; Death before Delivery; Twins.—No. 26. February 7, 1858.—A German Jewess, primipara ; about eight months and a half gone. Seen by a midwife at 1·30 A. M., when waters broke; head presented ; pains very feeble ; no progress; convulsions appearing ; at 8·30 A.M., she sent for me; messenger failed to find my house, and called in a German physician, who saw patient about 9, and ordered laudanum draughts. Convulsions and exhaustion, however, increased ; Mr. Blackman and myself arriving soon after 10, found her dead. The head was entering pelvis, very movable. I laid open the uterus ; the placenta was spread all over the anterior aspect of the uterus, stretching to fundus, and round to right side. The fœtus which presented being removed, I found another in an unbroken amnion; both girls; the placenta was single. This removed, I inverted the uterus for thorough examination ; no laceration ; pelvis not contracted. I learned that this poor woman had been much prostrated by misery and want of food. This had probably induced a degree of uterine inertia; but another circumstance contributed to retard delivery; the discharge of the amniotic fluid of one sac, and retention of the fluid of the other sac broke the contractile power, and frustrated the effort of nature to expel the first child. The feeble contraction could impart no expulsive action on the presenting child, because the force had to be transmitted through the fluid medium of the unbroken sac. It was left to regret that forced delivery had not been performed at 9 o'clock, or earlier.

Puerperal Mania.—No. 7. October 27, 1857.—A pluripara, delivered normally. Mania appeared on the third day ; she got out of bed and went into the street, thinking " her husband wanted to do away with her ;" she was still suckling her child ; she was removed to an asylum.

Puerperal Mania.—No. 32. March 11, 1858.—Pluripara, became delirious without violence some days after ordinary labour. There was excessive debility, anemia, and rapid weak pulse ; sleeplessness ; some milk ; under sedatives, and generous diet, she recovered in about a fortnight, without its being necessary to remove her to an asylum.

Tubercular Pneumonia and Polypus.—No. 6. November 3, 1857.—This patient was suffering from phthisis at time of labour ; pneumonia appeared soon after. The pneumonic complication having been subdued, I had her removed to the Metropolitan Free Hospital, under the following circum-

stances:—She has had three living children; but her last five pregnancies all ended prematurely; the present one earlier than the rest, namely, at fifth month. After labour, a solid substance protruded externally; "it seemed to have a sort of opening at end, out of which blood came." Seen by a midwife and a surgeon; she was assured it was of no consequence. I saw her on the third day; the os uteri was low; the anterior lip jagged, the posterior smoother; the os admitted two fingers, which, penetrating half an inch, touched a solid, fibrous-feeling, rounded body; dragging it gently by aid of forceps caused pain. In the hospital she was kept under observation as to polypus, care being bestowed to improve her health. The polypus was felt daily, till one day, after a very minute examination, carrying the finger close around the base, which was broad and rising from the cervix, the tumour came away some hours afterwards. The next day the os, which had previously been patulous, was now closed; she then did better; all flooding and discharge ceased. She died, some months later, of phthisis.

Exhaustion from Phthisis; Death.—No. 37. April 27, 1858.—This poor woman had been attended for consumption by the parochial surgeon during her pregnancy. She sank of exhaustion from this disease the day after delivery.

Case No. 6 suggests the question as to the expediency of removing polypi which make their appearance at the time of labour. The fibroid polypus, being constituted of tissues similar to the normal structures of the uterus, follows the same law of growth and development during pregnancy, and of involution after labour. It has been held, therefore, that it is injudicious to remove polypi during the puerperal state. I believe that in most cases a different principle should be followed. The fact of a polypus being in process of involution, is no sufficient reason against removing it *quàm proximè*. That involution will not, at least we have no evidence that it may, proceed beyond a certain point, and so long as a polypus remains, it is liable to cause exhausting hemorrhages at the menstrual periods, and to endanger life in a future pregnancy. It happened that in this case the polypus was removed by a very easy process, otherwise it was my intention to excise it on the next day.

Art. V.—*On some Actions performed by voluntary Muscles, which by habit become involuntary; with Practical Applications.* By Jonathan Osborne, M. D., King's Professor of Materia Medica, &c., &c.

"Illustrans commoda vitæ."—Lucretius.

The collection of habitual actions which contribute so much to form the character of each individual, and by which he is identified no less than by his features, commences in infancy, and continues to receive new accessions from education and imitation up to extreme old age. Some of these habits, which have not been thought worthy of notice by physiologists, and which do not come under any other department of science, yet furnish matter for consideration to the physician.

The habits which form the subject of my present observations may be divided into those occurring, firstly, when asleep; and secondly, when awake.

THE HABITS DURING SLEEP.

The attitude assumed during sleep is always that which admits the greatest relaxation of the muscles of voluntary motion, and the greatest freedom for the movements of those engaged in the performance of the internal functions, and especially for the movements of the heart and diaphragm. In our own case, and in that of all the animals with whose habits we are sufficiently acquainted, the horizontal posture is always adopted, and in no class is this more to be remarked than in birds, who, although prevented from lying down, and obliged to remain perched on the branches of trees, yet place the head more or less on a line horizontal with the body, and most frequently under their wings. The effect of this horizontal position of the head is to favour that increase of blood in the vessels of the brain which is required for sleep[a].

During infancy the child usually sleeps in whatever posture he may be placed, but among adults the case is different. At a time when I was engaged in some investigations respecting the more frequent occurrence of pneumonia in the right than the left lung, I engaged some friends who were connected with public establishments to ascertain by actual observation whether the greater number slept on the right or the left side. For this purpose they went through the dormitories when the inmates were in their first sleep, and the following results were obtained:—

[a] See "Some Considerations tending to prove that the Choroid Plexus is the Organ of Sleep." By the Author. London Medical Gazette, June, 1849.

1st. In four boarding-schools of boys and girls, mostly under fourteen years of age, the numbers were nearly equal, viz., on the left side, 260 ; on the right side, 248 ; and on the back, 234.

2nd. In two establishments containing young persons of both sexes, but above the age of childhood, the numbers were—On the left side, 23 ; on the right side, 58 ; on the back, 29.

3rd. Of the soldiers at that time quartered at the Pigeon-House, and inspected by orderlies during three successive nights, the returns were—on the left, 22 ; on the right, 44 ; on the back, 62. It is to be observed that these last returns were made during the hottest summer weather, when all are most disposed to lie on the back.

From the above observations it appears that in childhood the tendencies to sleep on the left or right side or on the back are nearly equal; but that, as age advances, those who sleep on the left are only the half of those sleeping on the right. Now, let us compare this with the most authentic and extensive reports on the comparative frequency of pneumonia in the left and right lung. In Pelletan's Report of 75 cases, the frequency of the disease in the left lung, compared with it in the right, was as 1 to $2\frac{1}{2}$; and in Andral's collection of cases there were 58 in the left, and 121 in the right lung : that is, rather less than as 1 to 2. This conformity between the frequency of pneumonia and that of persons lying on the right lung can hardly be accidental ; and taking it in connexion with the fact that the cases of pneumonia which came under my care occurred in the lung on which the patient was accustomed to sleep, as far as it could be ascertained, I consider that I have been fully justified in advancing the opinion held by me for several years, that the greater frequency of pneumonia in the right lung is caused by the prevalence of the habit of lying on the right side during sleep ; which is also conformable with the greater tendency of the base of the lung to the same disease resulting from our upright posture.

The reason for the preference of lying on the right side appears to be, that the weight of the liver is thereby kept from pressing on the abdominal viscera, while the same position is also most favourable to the freedom of the heart's action. The same preference appears to exist among quadrupeds in general, and on the same account.

In disease the posture during sleep is altered in order to accommodate to the circumstances of the part affected. Thus, as is well known, in pleurisy the patient diminishes pain by

not lying on the affected side at the commencement; but when effusion has taken place, then he lies on the affected side, and is compelled to do so, unless in some exceptional cases, in which the effusion is held in separate chambers by adhesions, and thus prevented from pressing on the heart or root of the lungs. In all affections of the head great aggravation is experienced from lying on the back; and persons suffering from ordinary headache connected with congestion, find relief from placing the head forwards. In this posture, while the arterial flow is discouraged, the return of the blood through the sinus and veins is promoted. It is a subject of general experience that nightmare comes on almost exclusively when the patient is lying on his back, and that it immediately ceases as soon as he turns forward. In this case, in addition to the causes now mentioned, there is usually the pressure of a distended stomach on the descending aorta, and a consequent increase of blood propelled through the ascending aorta to the vessels of the brain. Those facts prove that when a patient is confined to bed, and labouring under any affection of his head, it is best to direct him to lie on either of his sides in preference to his back. I have often had occasion to observe the importance of this measure; and it may, in cases of great debility, be sometimes requisite to assist him in maintaining this position by means of pillows or other supports placed behind his back.

The bent position of the limbs in sleep is a necessary consequence of the greater power of the flexor muscles than of their antagonistic extensors; and when the mouth or eyes remain open, or only partially closed, it must be inferred that from the depth of the sleep the muscular contractions of these parts have entirely ceased, and that they are abandoned to whatever position their ligaments may impose. Another phenomenon belonging to very deep sleep is *Snoring*. This sound is not produced by stoppage of the nose, as commonly supposed, but is the effect of a temporary paralysis of the velum, which becomes passive, and is flapped backwards and forwards by the currents of air in inspiration and expiration. This sound, although so common, and so easily imitated in the process of gargling the throat, is yet, under the name of stertorous breathing, enumerated as one of the most portentous symptoms of apoplectic coma,—and justly so. In health it never occurs except in the most profound sleep, and frequently becomes so loud as to waken the sleeper, and so force him to divide his sleep into several parts; in which, perhaps, we may trace a provision of Nature, whereby she has placed an alarm-bell close to the

organ of hearing, which sounds the tocsin, and rouses up the patient whenever his sleep tends to become congestive and comatose. Many snore almost as often as they sleep, and others never, except when overpowered by great previous fatigue. Those who wish to rid themselves of the habit can only effect it by sleeping less profoundly, as is done by creating a custom of waking at a certain hour, and by rousing up with alacrity at a given signal.

Habits of rising and lying down.—If we had sufficient opportunity of observing the mode of assuming the horizontal posture, and of rising from it, in our species, perhaps a uniform mode of performing these actions would be traceable among all classes of society ; but on this subject we can only refer to the animals best known to us, and in them a remarkable uniformity of habit may be observed. Thus the horse and the ox both lie down by first kneeling ; the ox remaining longer on his knees before bringing down his hind-quarter and his body to the ground. But, in getting up, the horse invariably rises first upon his fore-legs, previously to making any effort with his hind ; while the ox, on the contrary, rises first on his hind-quarters, and often remains on his knees some few seconds, until his hind-legs are completely established in their erect position. The elephant, the rhinoceros, and the pig rise first upon their fore-legs, like the horse ; but the goat, sheep, and deer, rise like the ox. Those habits are so firmly established that they are never changed except by disease or infirmity.

HABITS WHEN AWAKE.

Habit of the Erect Posture.—The erect posture, which is so uninterruptedly maintained by us during our waking hours, suggests some very important points for consideration. During it, the intestines and abdominal viscera are held suspended *sideways* from their mesenteric and other similar attachments, for about sixteen consecutive hours out of the twenty-four every day. During this space of time the effect of gravitation must be to occasion congestion in the lower parts. Besides this, the origin of the vessels, in consequence of their lateral attachment, must be more or less compressed, like the neck of a heavily filled bag hanging against a wall. It is true, that to diminish the congestion of these pendulous viscera, we have the support of the abdominal muscles. This, however, is not applied directly, as in animals with a horizontal spine ; but only laterally, and at an angle of disadvantage. Man is the only animal who holds his vertebral column upright. Even in birds, marsupials, and

monkeys, who hold it elevated at different angles above the horizontal line during their waking hours, an absolutely vertical posture is never maintained for any length of time.

In the human subject no provision can be traced for obviating the congestion which must be more or less a necessary consequence. On the contrary, the frequency of the pendulous abdomen of advanced years, of hernia, of hemorrhoids, and the uniformity with which ulcerations of the intestines occur at the most depending part, namely, opposite to their mesenteric attachment, and the fact that those affections are always mitigated by the patient being placed in the horizontal posture, all tend to prove that in maintaining the unvarying vertical posture we are following the dictates of custom and education rather than the laws of our organization.

With respect to the spine, the effect of this vertical posture is often apparent in youth, and long before the growth of bone is completed. How frequent the curves of the spine which have come on imperceptibly at an early age, and have been allowed to progress till they become deformities! How frequent the starting of some of the upper dorsal vertebræ, on the same principle that a twig when over-bent tends to give way in the middle! And, above all, how frequent the curve of the cervical and upper dorsal vertebræ belonging to advanced age, and which has been poetically compared to a shock of corn ripe for the sickle, and bending towards its mother earth! We have no opportunities of observing the relative effects upon health and longevity of the horizontal and erect postures in our species, for the latter has become too universal to enable us to institute a comparison; but these facts, taken in connexion with the fact that such distortions are not observed in any of the various animals with horizontal spines, and, above all, the fact which appears sufficiently proved, that in our species life, even under the most favourable circumstances, is much shorter than ought to be expected, are well worthy of attentive consideration, as pointing to an agency militating against health, and in universal operation. The success attending the recumbent posture in averting commencing deformities of the spine goes far to prove that Nature in this respect has been coerced beyond her powers, and renders it highly probable that the constant upright posture, which man has thought it due to his dignity to assume over other animals, produces disorders in his system tending to shorten life.

It will follow from these considerations that the erect posture should be relieved for some time during the day. Now, there are

other considerations equally cogent, but which do not sufficiently belong to the subject before us to enter on in detail, and which prove that man has also over-estimated his powers in sleeping only once in the twenty-four hours; and it cannot be shown that any provision has been made to enable him to remain awake for so many consecutive hours every day, contrary to the practice of all other animals, and contrary to his own practice in his earlier years. Hence it follows that both sleep and rest in the horizontal posture ought to be indulged in for some time, however short, during the day. This practice will be found to be attended with most advantage in the afternoon, before dinner, so as to divide the day into two nearly equal parts, each of them to be commenced when the individual has been refreshed by sleep, followed by food.

Habits of the Countenance.—Certain muscles of the face contract under pleasing emotions, as those drawing up the angles of the mouth; while others contract under painful emotions, as those drawing the same parts downwards: and in paintings these contractions are depicted by wrinkles in the skin drawn at right angles to the muscles. Such actions, although performed by voluntary muscles, are the result of an internal impulse, and take place quite independently of any wish or intention on the part of the individual. They are as involuntary as the increased secretion of tears from the lachrymal gland: and sometimes even against the efforts of the will exercised in a contrary direction. We observe in other mammalia, as the horse and dog[a], that the same muscles are set in action under similar emotions, and that the same play of the features exists in them as in ourselves, but is restricted by the want of volume and flexibility in the parts about the mouth and eyes. Education, in our case, has interposed, and has taught us to control much of the expression of the countenance. We see that, from an early period, among those nations from which our civilization is derived, notions of dignity have been always connected with tranquillity and impassibility of the countenance, as is well illustrated by the Egyptian Memnon and the Babylonian sculptures, no less than by those of Greece and Rome. The same conception of dignity exists at the present day. A countryman grins when the wind blows cold in his face, while the person of superior station keeps his features unaltered, as if not perceiving it. By constant intercourse with those whom

[a] The author once had a dog who distinctly smiled, and showed his teeth, when pleased, or when wishing to conciliate favour.

we wish to please is acquired that slight and almost imperceptible smile belonging to refined society, and which conveys the flattering notion that we are all objects of attraction and regard to each other. This subjugation of the natural expressions of the countenance, by which it is made to assume the form most pleasing to our associates, has become so general as to have almost obliterated the marks upon which the principles of physiognomy were founded by Lavater and others. Still, on the stage poignant mental emotions are depicted by the countenance, and more especially by those gesticulations which we are impelled to use to divert attention, and thus obtain a respite from our inward feelings. By means of these the actor conveys a notion of the intensity of those emotions which sometimes force a man to break through the habits of the society in which he moves, and to resign himself to the instincts of nature alone.

Habits of the Vocal Organs.—Connected with this subject is the consideration of the purpose fulfilled by the uttering of cries and groans when in pain, either moral or physical. The utterance of those sounds supplies the deficiency of language during infancy; but there is another purpose fulfilled by it, and belonging to all ages, which is, that suffering is thereby mitigated, and this not only by the consciousness of exciting the sympathy of others, but chiefly by diverting the attention of the patient from his pain. In exercising his organs of motion he thus relieves the nerves of sensation. The individual, then, who under bodily suffering neglects to bellow and roar may enjoy the dignity of a hero or a martyr, but in this omission he deprives himself of a source of mitigation provided for him, and pointed out to him by Nature herself.

Habits of the Eyelids.—The opening and shutting of the eyelids are actions required by the necessity of keeping the surface of the cornea moist, which we are warned not to neglect, by the sense of irritation when it becomes dry. The liquor appointed for this purpose not being secreted on its surface, but being conveyed by ducts from the lachrymal glands to the external angles, a more or less frequent motion of the eyelids must take place in order to keep it equally diffused over the surface. Although this kind of sponging of the cornea is performed by voluntary muscles, yet even from infancy it becomes an involuntary action, and is carried on without any perceptible intervention of the will. There are, however, some exceptions, in individuals who, from affectation or other causes, practise blinking or winking, along with other grimaces not necessary to mention. These we shall altogether

dismiss from our notice. On an average, taken from observations made on five individuals without their knowledge, I find that the number of closures of the eyelids within the hour is 424. The intervals, however, are very unequal. In a young lady engaged in a light, amusing employment, the closures within five minutes amounted to 62 ; but when her attention was exclusively engaged on an important subject, they did not exceed 17. In observing this action in a great number, as in a public assembly, we shall always find those most anxious and most absorbed in what is going on to close their eyes least frequently. This fact is analogous with another phenomenon, namely, sighing, in which breathing, although an act necessary to life, yet, being performed by voluntary muscles, is in consequence liable to interruptions from the intrusion of mental emotions of a depressing or absorbing nature. Under these we are withdrawn from the influence of one of our best established habits, and actually forget to breathe for several seconds, until forced to it by necessity, when at length we make up for the omission by one deep inspiration, called a sigh.

Habit of the Eyelids in the Near-sighted.—It is well-known that near-sighted persons frequently bring their eyelids so close as almost to come in contact when wishing to see distant objects without the aid of glasses. The assistance thus obtained arises from the sudden contraction of the lids sweeping together the tears which happen to be on the cornea, so as to form a concave surface, which, with the circular figure of the cornea behind, forms a double concave lens. That the assistance thus obtained is not due to the narrowing of the field of vision is evident from the fact that it does not continue as long as the lids are maintained in the closed position, but is only momentary, as is well known to the near-sighted, and requires for its reproduction frequent repetitions of the contractions, suited to the quantity of the fluid that may be present. This is best understood by a figure ; but the improvement of the sight of distant objects obtained in this way causes the habit of peering peculiar to the near-sighted, and which often imparts to them a characteristic expression of countenance.

Habits of the Deaf.—In cases of dull hearing two habits are acquired,—first, the mouth is kept open ; and second, the hand is placed behind the ear, so as to form an enlarged concha directed towards the place from whence the sound proceeds. In order to ascertain the actual amount of assistance derived from these practices, I experimented on three individuals :—No. 1, with dull hearing from rupture of the membrane of the tympa-

num of both ears; No. 2 and No. 3, persons of average capability of hearing. The sound used was the ticking of a watch, held in the same position and in the same apartment. The following were the greatest distances at which the watch was heard:—

	Mouth closed.	Mouth open.	Hand behind ear.
No. 1, of dull hearing,	1 foot.	15 inches.	3 feet.
No. 2, of average hearing,	5 feet.	7 feet.	9 ,,
No. 3, of average hearing,	5 ,,	9 ,,	11 ,,

The average of the above:—

Hearing without help,	44 inches.
Hearing with the mouth open,	69 ,,
Hearing with the hand behind the ear,	92 ,,

This practice, then, of holding the hand behind the ear, so generally adopted by deaf persons, is to be regarded with some indulgence, inasmuch as by means of it they are enabled to hear at double the ordinary distance, and ought to be taken by others as a signal to raise the voice and to speak loud enough to be heard.

Habits of the Arms.—In the use of our fore extremities we have been instructed from early childhood to employ the right arm in preference to the left; and those who have disobeyed the maternal injunctions on this subject appear awkward, and are stigmatised as left-handed. This preference for the right hand, although arbitrary, and not founded on any anatomical differences, is yet universal, as far as I have ascertained, and certainly has existed from the remotest antiquity. In the Babylonian, Egyptian, and Greek representations of the human figure, we see the right hand scattering the seed on the ground, drawing the bow, wielding the sword, or holding up the emblems of royal authority. Along with the use of the right hand the organs of sensation as well as motion at the right side—as the eye, the ear, and the leg, are also used in preference to those of the left, and in consequence have their activity and growth promoted. Thus the right hand and foot require a larger glove and shoe than the left, and even the right whisker grows more than the left. The right eye is more widely opened than the left, and the symmetry of the countenance is generally disturbed by the muscles of the right side of the face being more developed than those of the left.

Habits of Locomotion.—Locomotion in man is performed

under peculiar conditions, he being the only one of the mammalia who walks exclusively on two legs. Yet, on closer examination, we shall find that his mode of progression is not so totally different from that of a quadruped as may be supposed: although unconsciously to himself, yet he swings his arms so as to correspond with his legs, in the same way as the four legs are moved in the quadruped. Unless interfered with by the drill-sergeant or the dancing-master, he acts under the same instinct, each arm moving at the same time as the opposite leg. The quadruped, at each step, supports his body on the left fore and the right hind-leg, or on the right fore and left hind-leg, but always so that each fore-leg shall be either raised or planted on the ground at the same time as the hind-leg on the other side. The simultaneous action of each of our arms with the opposite leg is universal, manifest, and without any exception, unless when the arms are otherwise engaged and restrained so as to disguise it, but in going along the street we observe all ranks and conditions to agree in this, that at each step, each leg is put forth at the same time with the swing of the opposite arm.

It is a general fact that quadrupeds with the shortest legs take the greatest number of paces within a given time, and among ourselves tall men take the slowest steps. Indeed, every man, when walking alone and uninfluenced by others, adopts a pace peculiar to himself. In a certain society in which it was necessary to walk through a long, dark, narrow passage before arriving at the place of meeting, it was a frequent practice among those within the apartment to call out the name of the individual approaching the door merely from the sound of his steps, and this they were generally enabled to do, although the society consisted of above thirty persons. The reason why each individual, when uncontrolled, adopts one certain pace in preference to another appears to me to depend on two principles. The first is, that, as in quadrupeds, the rate of going depends on the fore-legs, so in man the rate of going depends on the swing of the arms. This is rather an instinct than a habit, for it continues and appears invincible, although often interrupted and interfered with by our education, both military and civil. The second principle is that the swinging of the arms is altogether involuntary, and performed by gravitation. The proof of this is that the swing occupies the same time as the vibration of a pendulum of equal length, and that the rate of the swings vary with the length of the arms in different individuals, according to the law of gravitation.

Hence it is that tall men, as having the longest arms, take the slowest paces. This correspondence between the swings of the arms and the vibrations of pendulums of the same length, and the accuracy with which the action of the legs keeps time with them, is easy to verify by observing the walk of any individual who has not been tutored; as, for example, a countryman going quietly by himself along an unfrequented road. The most frequent rate is that of a pendulum of twenty inches, that being about the length of the arm of the adult in its ordinary flexed position, but when the individual wishes to quicken his pace he shortens his arm, by bending his elbow-joint still more, and when proceeding to run he bends both the elbow and the shoulder-joint, so as to contract it to the utmost. Thus the arm is used on the same principle as the *metronome*, for the purpose of beating time to the legs.

Man being peculiar among the mammalia in making no use of his upper extremities, either for sustaining or propelling the weight of his body, and his lower extremities having to undergo all the labour of progression, a necessary consequence must be an increased flow of blood to the lower limbs, and a tendency to hypertrophy of them, and atrophy of the upper limbs. In domestic fowl who have changed their natural habits so much as exclusively to walk, and to abandon the use of their wings, the muscles belonging to the wings lose the red colour which they have in the wild state, and exhibit in a very striking manner the effect of this perversion of the natural use of the parts, in the difference of colour between the white meat or what is called the breast, and the legs, of domestic fowl. Hence it follows that in the human subject, from the unequal division of labour, combined with gravitation, there must be a greater tendency in the lower limbs to all the diseases affecting the muscular and ligamentous structures. This is notoriously the case: and, besides these, we find in them other diseases, as varicose veins, which are peculiar to them alone.

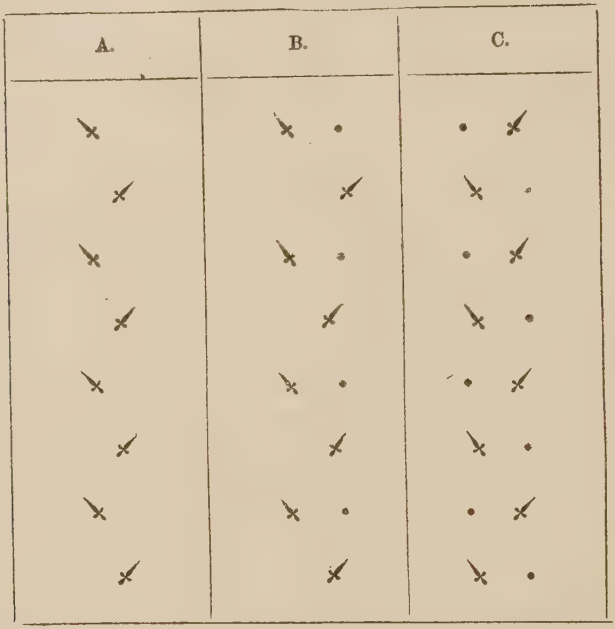
From the amount of labour thus thrown on the lower extremities, man has been impelled, from the earliest ages of the world, to resort to the assistance of other animals, and to construct vehicles of different kinds, in order to obtain assistance in locomotion. But amongst all these contrivances it appears strange that nothing has been done to equalize the labour of progression between the upper and lower extremities, by making the former take some share in it. Any assistance from this quarter has hitherto been sought for only by the lame or infirm, who

gladly avail themselves of sticks or crutches when suffering under pain or debility, but are glad to cast them away as soon as they are able to move without them. It is evident that we have some instinctive tendency to this mode of assistance, from the general practice which prevails of carrying canes or sticks, and which few are able altogether to resist. It is, however, not unworthy of science to inquire whether this mode of assistance should not be both more effectually and more universally used, and not, as at present, confined to those who are actually coerced by pain or infirmity.

When two sticks are employed, as light as possible, *so as not to interfere with the vibration of the pendulums formed by the arms*, and of the proper length, so as to enable them to be pressed firmly on the ground with the hollow of the hand, and, in obedience to instinct, placed, each of them, simultaneously with the opposite leg, then the individual has all the advantage of walking like a quadruped. It is true that, from our erect posture, the position taken by each stick must be almost on the same line with the opposite leg, instead of being in advance of it, in this resembling the gait of the giraffe, but no inconvenience results. The centre of gravity being in the line between the stick and the opposite foot, the symmetry of the gait is preserved, even more than in the ordinary walking without sticks. As for the use of one stick, as commonly practised, it affords a support only at every alternate step, and if any weight is laid on it, the symmetry of the gait is destroyed, and a tendency to habitual obliquity of the spine and pelvis must result; but with two sticks the individual has it in his power to take one-half of the weight of his body off his legs, and to place it on his arms, or, if not wishing for so much as that, he, even by a moderate degree of pressure on each stick, can obtain a very sensible degree of ease. A pressure, comparatively slight, with the stick on the ground, is equivalent to twenty-five pounds, and this pressure may be increased or modified to suit the requirements of the individual, being so much of the weight of the body taken off the opposite leg. An additional advantage not to be omitted is, that at each step the stick may be made not only an agent of support, but also of propulsion, by pressing on it at an acute angle, looking forwards, and that thus the sticks may be made to act the part of a velocipede.

What has been stated in the foregoing observations may become more evident by the following figure, intended to represent the tracks left by the pedestrian on the ground.

A represents the footsteps of an individual walking without assistance. B, the same of one using a stick in his right hand. C, the same of one using two sticks.



From the above it is manifest that, in addition to the other advantages of using two sticks, the centre of gravity is not shifting from one leg to the other, as in the ordinary walker, but that it is kept in a line more or less approaching the central point between the stick and the opposite leg.

As an experimental proof, I may add a trial made by a certain individual, weak, from different causes, on his lower extremities, but of the average strength of arms. By the use of two sticks employed in the way now mentioned he was enabled, after a little practice, to surpass, both in rapidity and long endurance of locomotion, the best efforts of four other persons, his juniors, and possessed of an average power of walking.

These are some of the observations which have occurred to me respecting involuntary actions performed by voluntary muscles, and which appear to have escaped the notice of sys-

tematic writers on physiology: many more remain to be considered. The investigation of such subjects, although apparently trivial, yet may become practically useful, and may lead to improvement in the exercise of many of our daily avocations.

Art. VI.—*The Cerebro-spinal Symptomatology of Worms, especially Tape-worms.* By Thomas P. Heslop, M. D., late Senior Physician to the Queen's Hospital, and Professor of the Practice of Physic, Queen's College, Birmingham.

(*Continued from* vol. xxvii. p. 275.)

The facts adduced, in reference to the causation of serious aberrations in the nervous functions by the presence of intestinal worms, will appear at a glance sufficiently numerous and cogent to warrant the statements with which I set out. Their significance is enhanced by the consideration that they constitute the whole number of my recorded cases during the past seven years, with one or two unimportant exceptions, too slightly reported to warrant any inferences affirmative or negative. In the discussion of questions of this kind it is far more important to obtain the entire experience of one observer, extending over many years, than to select the proofs of a given proposition from the cases of many persons, all of whom may possess equally illustrative evidence of the converse proposition, and none of whom may have taken the requisite precautions to exclude error. Cases so obtained, whether arranged statistically or otherwise, are very liable to lead to absolute error, and, at the least, expose the reader to the probability of forming an erroneous estimate of the frequency with which given results spring up under certain assigned circumstances.

I have observed that the symptoms of the presence of worms have, in fact, a striking uniformity, and give a peculiar physiognomy to a case. Since the first part of this Paper was in print I have seen a good illustration of this. A lady, about thirty-five years of age, of pale complexion, consulted me for most obstinate headach and general neuralgic phenomena. The senses were dulled; the skin dry; thirst considerable; urine much more copious than natural, and pale. Though doubtful of the real nature of the case previous to an examination of the urine, I yet ventured to hint that probably worms were at the bottom of her neuralgic complaints, and prescribed an anthelmintic draught. No worms were passed, and the urine was found, though of low specific gravity, to be free from any other

peculiarity. The idea of worms was almost abandoned, yet, three or four weeks afterwards, a very large lumbricus[a] was passed into the clothes while going up stairs, and its expulsion was attended with a certain amount of relief. At first sight, this case seemed to warrant the fear that some chronic kidney affection was the cause of the symptoms, and I did not feel satisfied upon this head until I had enjoyed the opportunity of a careful examination of the urine. But it was not the only time that such doubts have entered my mind in investigating the symptomatology of worms. There is the strictest similitude between the cerebro-spinal symptoms of some forms of Bright's disease, especially of that form attended with the hard, contracted kidney, and those attendant upon worms, particularly the tape-worm. So close is this likeness, that in cases where I should have otherwise predicted the presence of worms, my mind has been suspended in doubt until after the urine had been subjected to scrutiny.

This point is too interesting, and offers too many valuable considerations for our notice, in speculating upon the conditions of these symptoms, to be passed over without a little further comment. What—looking at the observations which have been already adduced—may be fairly termed the phenomena of a representative case of vermination in the adult? They are about as follows :—A man, with a pale face, but fair *enbonpoint*, presents himself to his attendant, complaining of dull headach, not limited to any particular region of the cranium, but perhaps more marked in the frontal region than elsewhere. This headach does not offer any marked exacerbations or remissions, but is almost constant, and sufficiently severe, without being excruciating, to render life, if not a burthen, at least unhappy. Giddiness is so severe that he often staggers about like one intoxicated; and when this symptom is present to a less degree, there is still almost continuously a sense of confusion and insecurity, which renders walking a serious effort. The ears are affected with a constant buzzing, and a great variety of noises, described sometimes as being like that produced by the boiling of a tea-kettle, sometimes like the letting off of steam from a boiler, not rarely like the rumbling of thunder. The acuteness of the sense of hearing is, at the same time, unimpaired. His vision is dull. Fine webs seem to be constantly before the eyes, so that every object wears a hazy aspect; at other times, dark spots or brilliant flashes obstruct vision. Next to the

[a] I may take the opportunity to observe, that wherever I mention "lumbrici" I mean the "ascaris lumbricoides;" and when I write "ascarides," the "oxyuris" or "ascaris vermicularis."

headach and giddiness, it is the increasing imperfection of this sense which most alarms the patient. He finds that in seizing objects his hands are not so thoroughly under control as formerly. They and the arms are in a state of constant tremor; and the legs are similarly, but to a less degree, affected. This symptom is sometimes so severe that he finds it difficult to hold objects firmly, unless he concentrates his attention upon his actions. He has a variety of unusual sensations about his body, all more or less referable to numbness. The stomach occasionally rejects its contents, and he is troubled with a general sense of uneasiness about the abdomen, sometimes with a sharp colicky pain. He has, perhaps, lately suffered a severe convulsive seizure, or been the subject of a transient stupor. If the patient be a woman, violent hysterical crises have occurred, or genuine epileptic attacks. The face is not merely pale; there is an aspect of languor and heaviness, much increased by a drooping of the upper lids in a severe case. Such is an abstract of the more common symptoms of worms, and I know of one disease only which presents a similar combination of morbid signs, and that disease is morbus Brightii. Fortunately the renal secretion is at hand to solve the difficulty and to exclude doubt.

This similarity of symptoms engendered by causes apparently so opposite as toxœmia on the one hand, and intestinal irritation on the other, has led me to doubt the generally received opinion, that the nervous phenomena of worms are connected with the mere results of these parasites, as irritants of the intestinal tract. There is no excentric irritation known to us which produces like effects, and all analogy is in favour of the view that a generalized lesion of the nutritive function, as indicated by a morbid blood-plasma, is the real source of these remarkable pathological states. This view is confirmed by the reflection that a profound lesion of the primary assimilating processes generally accompanies, and probably precedes, the generation and development of these worms[a]. And in fact, it is difficult to explain their presence, except on the supposi-

[a] Bremser uses the words, "verminous disease," to indicate the general condition on which worms depend, even when worms are not passed. His remarks are worthy of quotation, though the very imperfect knowledge at that time of the generation of entozoa detracts from their importance. "I intend," says this author, "by the term 'verminous disease,' a derangement, or rather a disproportion in the functions of the organs destined for digestion and nutrition; during the duration of this derangement there are produced or accumulated in the intestinal canal, substances by the aid of which there may be formed, under favourable circumstances, worms; but, nevertheless, there is no absolute necessity that their formation should result."—*Traité Zoologique et Physiologique sur les vers intestinaux de l'Homme.* Par M. Bremser. Traduit de l'Allemand par M. Grundler. Paris: 1828.

tion that a suitable nidus has been previously prepared in the shape of morbid secretions, wherein the germs can fertilize. To these germs probably most persons, both in civilized and uncivilized life, are pretty frequently exposed, yet a large majority of mankind undoubtedly escape being infested by them. It is consonant with all our knowledge of natural history to suppose that those who escape are in a physiological condition, have their secretions in a healthy state, and consequently offer no resting-place in which the ova of entozoa can become developed. Hence, too, the greater frequency of these parasites among the ill-fed and half-fed denizens of our great towns, a fact which does not compel us to seek for its cause in a greater exposure to the germs under such conditions. Dr. Elliotson very justly observes, that "generally speaking, these worms prevail more especially in proportion as the patient is weak. We know that persons who are exhausted from fever will become the subject of vermin. In extreme debility of the constitution, a patient may be cleaned several times a day, and be covered with a fresh crop of vermin! So it is, in general, within. The more weakness there is of the body, the more the entozoa thrive. Bad air, bad food, and the want of sun, will contribute to their appearance. When rabbits are kept in a bad place, they become subject to hydatids; as do also sheep in wet pastures"[a].

We find a further confirmation of these views in the circumstance that, though relief is speedy when the symptoms above related have been brought about by the presence of worms, it is by no means immediate, as it would be if a mere intestinal irritant were the sole condition of their existence. So far from being immediate, the relief consequent upon the expulsion of worms, in severe cases, is but slowly effected, even when we find no reason afterwards to suspect the presence of others in the body. This is very manifest in many of the cases, and deserves notice in a practical point of view, as it serves to demonstrate the necessity for careful dietetic observances, and judiciously applied medicinal agents for some period after the end in view has been apparently gained. Here, too, is the source of the frequent disappointment of patients, who begin to despair of cure when they observe a constant recurrence of the symptoms and of the parasites, in spite of powerful anthelmintics periodically administered. The palliative is the vermicide; the radical cure is to be found elsewhere, though medical doctrines lead to a reverse conclusion.

[a] The Principles and Practice of Medicine, Second Edition, p. 1106.

There are, confessedly, certain disorders engendered or maintained by worms, whose relief is strictly synchronous with their expulsion, whether effected by nature or art: such as hooping-cough, infantile convulsions; but these exceptions do in fact prove the rule. The nervous system in early life very quickly sympathizes with intestinal irritation, and a crisis occurs, such as is well calculated to draw the attention of the physician to the possible presence of worms, long before they have materially impaired the general nutritive functions. The species of worm present in most of these cases, too, is such as forbids the belief that a very marked interference with those functions is likely to occur. Ascarides in the great majority of these cases, and lumbrici in the rest, are the worms with which we have to deal. The former seem to infest the large intestine almost exclusively, and its extreme portion in most cases; while the lumbrici, though invading, by preference, the small intestine, do not offer, unless accumulated in great numbers, the enormous bulk so common in tænia, and are, therefore, less likely to interfere with the normal function of the part.

In reference to the aggravation of hooping-cough in certain states of the economy, Dr. Whitehead, in his third Report of the Manchester Clinical Hospital, says:—"By a similar kind of sympathetic irritability, the presence of worms in the intestines will aggravate the symptoms, or prolong the duration of hooping-cough almost indefinitely; in several instances in which the symptoms continued unabated unduly long, and where it was found that worms existed, the expulsion of these parasites was immediately followed by mitigation of the symptoms, and speedy cure."

It is, however, to be observed that these and similar symptoms are frequently to be noticed in tænia. Thus, Dr. Watson[a] gives a case from Bremser, "of a child eleven years of age, afflicted with tænia, who had a troublesome dry cough. It was observed that her cough was suspended for two months, just after a very large portion of the worm had been brought away by anthelmintic medicines. This kind of coincidence happened not once only, but three or four times; and, at length, when the whole of the worm had come away, the cough was permanently cured."

Dr. Graves[b] gives a case of a young lady who had fits of coughing of extraordinary intensity; the cough was dry, loud,

[a] Lectures on the Practice of Physic, Fourth Edition, p. 577.

[b] Clinical Lectures on the Practice of Medicine, Second Edition, edited by Dr. Neligan, p. 26.

hollow, and repeated every five or six seconds, night and day, when she was asleep as well as when she was awake. In spite of this terrible agitation, she did not fall away proportionally. Every imaginable measure was employed, but no relief followed. The case was "given up in despair." Some time afterwards Dr. Graves heard that she had been cured all at once by that ubiquitous medical practitioner, "an old woman," who had suggested a dose of turpentine and castor oil, for the purpose of relieving a sudden attack of colic; two or three hours afterwards the young lady passed a large mass of tape-worm, and from that moment every symptom of pulmonary irritation disappeared.

It is hardly necessary to draw attention to the frequency with which "fits" of every variety are produced by worms. As I have before observed, this is abundantly recognised so far as regards infantile life, though certainly insufficiently in reference to the adult. It is remarkable that wherever convulsive seizures are mentioned in connexion with worms, either by Willis or Heberden, lumbrici are alone mentioned[a]. This can hardly spring from ignorance of the distinction between round and flat worms,—as it is undoubtedly as old as Hippocrates,—but results, I believe, from observation of the superior liability to these seizures in persons invaded by this species. Their peculiar conformation, and resistant head, are favourable for attacks upon the wall of the intestines—Von Siebold believing that they are able to force asunder its fibres; and their tendency to wander to the anus or to the pharynx is one of their characteristics. Küchenmeister observes that "if the worm be disquieted by any causes, it begins to wander about in the intestine which it inhabits, producing all kinds of disorders, which may even lead to death. According to the irritability of the individual, the number of the wanderers, the place to which they have wandered, and lastly, according to the power of the worms themselves of asserting their vital activity, so varies the danger to which these wanderers give rise"[b]. These causes of agitation are internal and external. The former, seated in the worm itself, are, perhaps, as Küchenmeister suggests, only to be found in the sexual actions: it must not be forgotten that these are not, like tænia, hermaphrodite. The latter are in re-

[a] It is necessary, however, for the reader to observe, that, in these and other early authors, the word "lumbricus" is frequently employed as a general term for all worms, in accordance with its original Latin meaning, and not as by the moderns, in a *specific* sense.

[b] Manual of Animal and Vegetable Parasites, translated for the Sydenham Society, p. 415.

lation with the ingesta, some of which must be more or less repugnant to the parasite.

The singular frequency with which lumbrici are found in the bodies of those dead of tetanus has not yet obtained the attention it deserves. It is probable, too, that a more thorough examination of the intestines, in such cases, would reveal their presence still more often. My friend, Mr. West, of the Queen's Hospital, tells me that a young woman, aged 17, was admitted into that institution, under the late Dr. Fife, in the year 1855. She was anemic in appearance, and the catamenia were irregular. A peculiar "tonic convulsive condition" of the muscles of the right arm was noted on admission, which had resulted, as she stated, from a blow she had given to the thumb of the right hand while cleaning a pair of boots. She was believed at first to be suffering from hysteria, but she was seized with symptoms of trismus, and died in less than forty-eight hours. No appreciable lesion of the brain and spinal cord was discovered. All the thoracic and abdominal viscera were healthy. A lumbricus was found in the neighbourhood of the ilio-cæcal valve.

A deeply interesting case of similar nature is reported by Mr. Johnson[a], of Bedford. A boy, aged eight years, was brought to the Bedford Infirmary on the 24th of July, with a lacerated wound above the right elbow, caused by the wheel of a cart passing over the arm. Sloughing took place, and, on the 30th, a large sore, four inches by two and a half, was exposed. The boy went on extremely well until the 8th of August; his general health improved, and the wound presented a most healthy appearance. On that day symptoms of trismus made their appearance, and he was ordered two grains of calomel three times a day. On the 10th, paroxysms of opisthotonos occurred every three or four hours. On the 13th the gums had become slightly affected, and the paroxysms were not quite so violent. On the 15th he passed four lumbrici, five inches in length. From this time until the date of his death (August 25th), the paroxysms appeared to diminish very much in severity and frequency; but the length of time that these symptoms had lasted, viz., thirty-two days, had rendered him so weak and emaciated, that he died exhausted. The mucous lining of the upper part of the small intestine was found much inflamed, and in the upper part of the jejunum three masses of lumbrici were discovered, numbering thirty-six. Mr. Johnson believed that there was an intimate relationship between

[a] British Medical Journal, October 28, 1858.

the tetanus and the presence of the lumbrici—a belief which appears to be justly based on the facts of the case.

Last summer a boy, about fourteen years of age, was admitted into the Queen's Hospital, under my care, labouring under the most violent tetanus. He had been affected by these symptoms about two days. There was an obscure history of an injury, as usual, but nothing could be found about the body to justify the statements made. A few hours after admission he died. The examination of the body was deemed very inconclusive. Softening of a small portion of the dorsal cord was observed; but there was some ground for the suspicion that the injuries accidentally occurring during the necropsy might account for this. Lumbrici were found in the intestinal canal.

It is within the limits of fair speculation to suppose that in these cases, and others of a like character, the tetanic phenomena were excited by the lumbricus in persons who already were in a condition favourable to the development of such phenomena, but who might have escaped had the worm not been present. The case reported by Mr. Johnson especially warrants this opinion.

Many of my own cases tell a history of fits in connexion with worms,—often the most violent hysterical crises were observed, of which Case XLVII. is a good illustration. Genuine epileptic seizures were also several times observed. The subject of Case XLV. had been first seized with an epileptic fit five weeks before application. He was a boy thirteen years of age. There was nothing in the history of the case or in his conformation to account for the fits: the presence of bits of tænia and ascarides was the sole cause that could be arrived at. It is stated that he was conscious of the approach of the fit, which commenced with dimness of vision; a sort of tremulous movement then pervaded the whole frame, and he remained stupid after the fits, of which he had two nearly every day. Ascarides were several times observed in his stools during the period he was under notice, and their evacuation was attended with the disappearance of the fits.

Case XXX., a girl, aged 9, is an illustration of a common effect of worms, namely, sudden fits of insensibility. The occurrence of such attacks in the young should always excite the inquiries of the medical attendant in reference to the passage of worms. Case VI. was a woman, aged 32, who had suffered from fits, the first of which had been followed by the loss of the use of the right upper and lower extremity. This she had gradually recovered, but was subject to giddiness,

impaired vision, and headach. Anthelmintics brought away tape-worm; the headach was relieved, and no fit came on afterwards.

In discussing epilepsy Heberden[a] observes, that "in ætate puerili, membrorum distensiones sæpe fiunt ex lumbricis, aliisque intestinorum affectibus, quibus proinde medicamenta leniter purgantia auxilio erunt, et causam mali expellent." There is, I repeat, no lack of appreciation on the part of authors of the common causation of convulsive seizures in infantile life by worms, but a very inadequate estimation of the same conditions in the adult.

That able writer, Romberg, admits the importance of this subject in reference to epilepsy, though in every part of his learned treatise he appears to me to recognize but imperfectly the part played by worms in nervous affections. After discussing the centric and excentric causes of epilepsy, he says: "The next focus of epileptic affections that we have to consider is the gastro-intestinal tract. Irritation proceeding from the intestinal canal, and of its glandular apparatus, the former more frequently in children, the latter in adults, acts as a cause of epilepsy; it may be induced by helminthiasis, and especially by the lumbricus, less frequently by tænia and ascarides, by catarrh of the stomach and intestines, and by inflammatory affections of the liver"[b]. He gives the case of a boy, aged 5, who had been subject to attacks of eclampsia, which occurred daily between 4 and 5 o'clock in the morning, and were preceded by headach. As there was a large accumulation of ascarides, purgatives of calomel and jalap were ordered, the effect of which was, that no regular paroxysm occurred for six days, but every day, at the same time, headach and giddiness, and an occasional distortion of the right ala nasi and angle of the mouth, supervened. Some days afterwards the fits recurred at the same hour, and were finally got rid of by means of quina.

In my remarks on Case XXVII. I have observed that I have felt much hesitation in giving a name to some of the seizures produced by worms. If "excentric eclampsia" would appear the fitting term for some of the cases, especially those occurring in early life, and, for the most part, caused by lumbrici or ascarides, it would seem inapplicable to many others, which rather deserve the appellation of toxœmic eclampsia, and are

[a] This sagacious author places lumbrici among the causes of vertigo, which he treats as a substantial malady. He says: "Lumbrici modo antecedunt vertiginem." Soëmmering's Edition, p. 351.

[b] A Manual of the Nervous Diseases of Man; translated for the Sydenham Society, p, 214.

assimilated to the well-known nervous lesions of Bright's disease, as before mentioned. But it is not so important to agree upon the precise nosological phrase wherewith to characterize these conditions as to thoroughly appreciate the diverse and often mixed character of these paroxysms. Intense hysteria, with the most violent jactitations, or, on the other hand, attended with an imperfectly developed cataleptic state and profound repose, sudden insensibility without convulsion, every variety of convulsive seizure attended with insensibility; or tonic spastic states, without unconsciousness, may constitute the particular expression of nervous sympathy, and yet acknowledge but one origin.

Few authors omit to place worms among the causes of chorea, although they are not named by Heberden in this relation, and Romberg[a] gives but little countenance to the doctrine. He states that the disease can scarcely be shown to be produced by irritation. "Reflex irritation most frequently resides in the intestines and genital organs; but under this head a more important part has been ascribed to helminthiasis than it is found to merit on closer examination." Notwithstanding, this author gives one illustrative case. A boy, aged six years, in whose fæces the mother not unfrequently discovered traces of ascarides, rapidly recovered under the employment of calomel and jalap powders, which brought away a large quantity of the oxyuris vermicularis. I arrived at the same conclusion with Romberg some time ago, from observing the infrequency of worms in the history of chorea. This disorder, indeed, seems to belong to the diathetic neuroses, and to acknowledge but rarely intestinal or other irritation for its cause. The subject of the nineteenth case was suffering from chorea, and had passed pieces of flat-worm. But here there was a marked systolic bruit. In such a case the rheumatic diathesis, or, in others, an extreme nervous mobility, may be the predisposing condition, while the presence of worms, or a fright, may be the immediate excitant[b].

I am indebted to Mr. West for the following details of a case of chorea. A woman, about twenty-five years of age, was admitted into the Queen's Hospital, under Dr. Fife, labouring under a severe attack of this disorder. She was a stout, healthy-looking girl, of sanguine temperament, and never had any illness until about a fortnight before admission, when spas-

[a] *Op. cit.*, p. 59.

[b] See the author's paper on the Connexion between Chorea and Rheumatism, in the Number of this Journal for November, 1858.

modic movements of the muscles of the face were noticed. These gradually extended over the whole body. Her gait became unsteady; she was unable to feed herself; articulation was very imperfect, and necessitated laborious efforts; there was considerable febrile excitement; the pulse full and bounding; face flushed; skin dry and hot; there was no history of rheumatism or fright; catamenia regular. The restlessness and jactitation became extreme, and finally, delirium of a maniacal character supervened, and death was ushered in by coma. The necropsy displayed congestion of the lungs and of the cerebral vessels, but nothing to account for the phenomena of this severe case, excepting two lumbrici, about six or eight inches in length, in the small intestine.

Bremser[a], who admits that persons labouring under worms —or rather, to use his distinctive phrase, the verminous malady—experience from time to time headach and singing in the ears, and have dilatation of the pupil; yet throws doubt upon the reality of the bond between certain grave nervous disorders and the parasites. He supplies us with some very curious cases which deserve quotation here. One, reported by M. Serres as a verminous affection simulating rabies, is as follows:— A child, thirteen years of age, was bitten by a mad dog. Six months afterwards all the symptoms of hydrophobia appeared, and he died two days afterwards. The necropsy revealed nothing extraordinary, with the exception that the large intestines were filled with ascarides, which completely obstructed their cavity. Serres and another physician attributed the death, not to the bite of the dog, but to the worms. This case is closely analogous to those of tetanus previously mentioned.

Krause is quoted as having seen a case of a young man, of robust constitution, aged 31, who had been attacked for many years with paroxysms of involuntary laughter. At every accession he experienced a malaise, which was relieved only by lying down flat on his belly. None of his previous advisers had questioned the patient about worms, which he admitted having passed some years before. The administration of efficient vermifuges immediately relieved him of all his disagreeable symptoms. Another young man, mentioned by Girandy, presented some very singular symptoms, one of which was that he found it impossible to walk over any substance, however small, even a sheet of paper. Every time he endeavoured to conquer this difficulty he fell into a state of syncope. Vermifuges effected the evacuation of many worms, and a cure resulted. A case is

[a] *Op. cit.*, p. 367.

quoted from Mœnnich, of a child between two and three years old, previously robust, who was suddenly attacked with paralysis of the lower extremities, strabismus, and distortion of the features. After the administration of vermifuges he passed eighteen ascarides, with a great quantity of glairy matter, and his health was re-established.

Bremser relates also the case, seen by himself, of a boy, nine years old, who had suffered from very violent and frequent attacks of epilepsy ever since he was two years old. He had also passed pieces of tape-worm. He was "fortunate enough to relieve his patient of the rest of the animal, and from that moment he had no further paroxysm of epilepsy." Bremser saw the boy five years afterwards, and relates that he had enjoyed perfect health in the interval. It is certainly sufficiently remarkable that so well read and experienced an author should write so dubiously of the general deleterious effects of worms upon the economy—his whole chapter on the diagnosis of their presence, and on the derangements which they may entail, being rather an attempt to ignore the conclusiveness of the evidence of such derangements than to give an exposition of their nature. Nay, he goes so far as to state that his reason for entering upon an account of the therapeutical methods proper to be adopted is connected only with the circumstance that every man who feels sure that he is infested by worms desires to be relieved of them. Bremser's chapter is, in fact, what he himself finally terms it, "a defence of these animals."—p. 400.

This author's treatment of his subject is, in truth, as the title of his treatise indicates, rather physiological than clinical; and some of the most authoritative works on the same subject deal with it in the same spirit. Küchenmeister expresses the opinion that the ascaris lumbricoides, when staying quietly in the intestine, and when not occurring in too great numbers, brings but little danger to the constitution. "As a general rule," says this author, "the host and his guests live very well together, and give one another very little mutual trouble."—p. 414. He discusses the phenomenology of tænia in a scarcely less contemptuous style:—"The stronger an individual is in himself, the less the irritability of his nervous system, the fresher his colour, the more regular his appetite and nourishment, the better his food, and the less he is inclined to diarrhœa—in one word, the less tendency he has to chlorotic phenomena, the less does he complain of his symptoms when he suffers from tape-worm" p. 142. I find myself able to agree with this latter passage, though in a different sense from the author; for I understand by it only that by so much as a patient is affected with

the ordinary symptoms of the parasite, in such proportion does he suffer from it. But this fact surely does not require such gravity of exposition. It would appear that the natural historical study of an animal, even so degraded in the animal scale as an entozoon, is attended with such peculiar charms, that physicians who devote themselves to such pursuits become attached to their object, and experience difficulty in assenting to the harmful nature of beings to whose investigation they have allotted so much valuable and, it must be admitted, well-spent time. This remark will not apply to M. Louis[a], who brought habits of minute clinical investigation and unrivalled powers of numerical arrangement to bear upon the question. The most careful disquisition upon the symptoms of tape-worm which we at present possess is unquestionably his well-known essay. That this distinguished man has so inadequately appreciated the cerebro-spinal disturbances attendant upon this parasite is, I think, owing to the unfortunate incident that his inquiries extended only over ten cases,—a number much too small to warrant, or, at any rate, to give security to the inferences drawn from them. Like everything else which has proceeded from the pen of Louis, this memoir has enjoyed the first place in professional estimation, and has given the tone to the statements of numerous subsequent authors. Dr. Watson has based his account of the symptoms of tænia nearly exclusively upon Louis's cases; and the statements of a writer so justly esteemed have, doubtless, mainly contributed to the formation of the common medical opinion. He gives the following as "probably the most distinctive" of the symptoms:—"Uneasy feelings in the epigastrium, which often abate, or are removed by eating; the appetite generally craving, but sometimes bad; itching of the nose and of the anus; nausea, colic, giddiness, a sour breath; less frequently loud borborygmi occur, and sometimes convulsions." This statement, although comprising no symptom which is not frequently met with in vermination, includes several which are infrequent in tænia, omits some of the commonest and most characteristic, such as headach, noises in the ears, flashes and webs before the eyes, tremors, &c.; and gives to the nervous phenomena in general an undue subordination in the general array of symptoms. But Louis supplies an authority for the whole.

This physician's observations were made in the year 1824 on patients in the Charité, Paris; and I think it desirable to give here an analysis of his cases, so far as they bear upon the

[a] Mémoires ou Recherches Anatomico-Pathologiques. Paris, 1826.

subject of this memoir. Case I. A woman, aged 19, had suffered from tape-worm from infancy, and for three years from frequent singing in the ears, and headach; sometimes from numbness and feebleness of the limbs. The expulsion of a tænia was attended with perfect relief from all symptoms. Case II. was a woman aged 35; had passed worms in her stools for four years. From that time she had suffered from headach, insomnia, pains in the limbs; and for two years from noises in the ears and weakness of vision. Case III. A woman, aged 30, had been in bad health for ten years, and for eighteen months had passed fragments of tænia. Since the first period she had been subject to hysterical attacks. Many tæniæ were evacuated, according to Louis; and several months afterwards she was observed to be in good health. Case IV. was a soldier, who had suffered for twelve years from tænia. He was tubercular. Pains in the limbs and cephalalgia had existed for six months, which seemed to have relation with the augmentation of the cough as his general malady proceeded. Great amelioration was effected by the vermifuge employed. Case V. was a Swiss who had been troubled with tænia for a year. A sensation of weakness was complained of; but it is expressly stated that he complained of no pain anywhere. Case VI., a man who had passed the worm for nine years. He complained of great weakness and sense of fatigue, but had neither cephalalgia nor impairment of the special senses. Case VII., a man aged 41; had suffered for ten years from the parasite. He had neither suffered from cephalalgia, pains in his limbs, or alteration of vision. Case VIII., a boy twelve years old, had passed tænia for fifteen months. It is stated that he had no cephalalgia, cramps, or pains in the limbs. Case IX., a man aged 72, noticed tænia in his stools eleven months before. There was no cephalalgia. Case X., a workman aged 49, had passed almost daily for ten years fragments of tænia. Pains in his limbs were greatly complained of; but there was no cephalalgia.

In his resumé, Louis assigns the "principal symptoms" as being colics; pains in the belly, of a varied description; itching around the anus, and at the extremity of the nose; a more or less marked derangement of the digestion and appetite, pains in the epigastrium, *rarely cephalalgia*, often, on the contrary, pains and lassitude in the limbs. He further declares that when pains in the belly, colicky pains, more or less severe and frequent, unattended with diarrhœa, exist for a certain period, accompanied by itching of the nose and anus, they indicate, in an almost certain manner, the existence of a worm in the intes-

tinal canal. These symptoms have in their union a remarkable aspect: they are not met with but in verminous affections; and we cannot well conceive these without them (p. 554). This author ignores the nervous phenomena by merely observing of them that they have nothing specific about them, and, by consequence, cannot have a place allotted to them among the diagnostic symptoms. Dr. Watson, on the other hand, admits that the diagnosis is *strengthened* by the presence of these symptoms. The first point that struck my attention in perusing Louis's memoir was the absence of all mention of tremors, a symptom so frequently present in my cases, and so constantly complained of by the patients. My suspicions of the presence of worms have often been first aroused by the evident tremulousness of the hands and the faltering of the speech. Another very common complaint, giddiness, is not so much as alluded to by Louis; yet the records of my cases offer abundant evidence of the important part which this symptom plays in the disorder. Headach occurs but three times among the ten cases; and in one the author evidently believes it was produced by the cough. But my experience leads me to the conviction that this symptom is by far the most constant of all those attendant upon the malady. Convulsive seizures are mentioned but once, and then only as hysteria in the third case. But it must be superfluous to remark upon the copiousness and conclusiveness of the evidence which demonstrates the connexion between convulsive attacks and worms. Noises in the ears occurred only in two cases; and weakness of vision once. But there is a too frequent repetition of these phenomena in my own cases to allow me to doubt their value as aids to diagnosis.

Louis paid special attention to the pupil, which, in all his cases, was of the natural dimensions, although its dilatation has been often insisted upon as one of the indices of worms. Thus Bremser, one of Louis's predecessors in these in u-ries, while mentioning singing in the ears and headach among the signs by which we can recognise the presence of intestinal worms, also observes that the eyes lose their brilliancy, they become wan, the pupil is enlarged, and the lower lids are encircled with a bluish zone[a]. I regret that the state of the pupils is mentioned in ten only of my cases. In four, they were natural; in four, dilated; in two, contracted. One of these latter is also said to have had "sluggish pupils."

But the positive statements of Louis are also worthy of our

[a] *Op. cit.*, p. 354.

attention. Among these is the pain in the belly. There can be no doubt that this is a very frequent symptom, as indicated in my cases also; but it has nothing about it characteristic, nothing to suggest inquiry as to worms; and it is sometimes altogether absent, as in Cases XLIII. and XLV., though stated to have been present in all Louis' cases. Occasionally flatulence and tenderness exist, when pain is wanting, or but little marked. The varieties and degrees of this symptom are, confessedly, very numerous; and not unfrequently it is absent over an extended period of a case, and suddenly makes its appearance with great severity. Thus in Case XLVI., it is observed that the patient had "a great pain occasionally in the epigastrium." My general impression is very strong that headach and giddiness are at least as frequent phenomena in the verminous malady of the adult as pains in the abdomen. In the fifty cases here recorded by me, the former symptoms are constantly mentioned; the latter are often wanting. But I refrain from giving a numerical ratio of the phenomena, for I am well aware that in many of the cases the abdominal symptoms did not receive the full attention bestowed upon those affecting the nervous system.

The appetite, though so much relied upon by the vulgar, offers but little worthy of notice. It is sometimes augmented, sometimes diminished, occasionally capricious, but often unchanged. No diagnostic can be drawn from it. Even in children, a marked voraciousness of appetite, so much associated by nurses with worms, is far more often the result of tubercular disease. One only of Louis' cases is stated to have had decided vomiting, an observation fully borne out by experience; its absence is indeed worthy of note, considering the occasional severity of other symptoms connected with the abdomen.

Louis assigns the next place, in order of diagnostic importance, to itching of the anus and nose. But the former symptom was absent in three-tenths of the cases, and the latter in three-fifths; one or other of these symptoms, however, was present in all but one, though in several but little marked, and absent with a curious frequency at the actual moment of observation. The fact of these symptoms being ordinarily absent over a considerable period of the case, deserves attention. They are so trivial as to be easily forgotten by the patient, and, unfortunately, the more frequent itching of the anus is very likely not to be mentioned by females, unless pointedly inquired into. Both of these phenomena appear to me to be related closely to the neighbourhood of the worms to the anus, and to be more manifest in early than in adult life. They must be viewed as

direct or reflex irritations, and are, probably, as Louis suggests, sometimes absent from the constitutional insensibility of particular individuals to sensations of an itching character. But this very consideration greatly militates against their diagnostic value. Allowing full weight to such reflections, however, it cannot be denied that these symptoms are of much importance, for, when markedly complained of, worms are usually present. The general recognition of their semeiological value is, indeed, so complete, that few persons think of worms as the possible cause of a given series of symptoms, unless the declaration of the patient either that they have passed some, or that they have suffered from these itching sensations, comes to the aid of the physician; while, on the other hand, in the absence of such declaration, he is very apt to ignore the whole subject. These symptoms are, notwithstanding, like many others, of high affirmative significance, but of very low negative value; and it is the necessity for a more complete appreciation of this, which loudly calls for a review of our present state of knowledge. Küchenmeister quotes from Seeger a valuable table of the comparative frequency of particular symptoms, from a statistical table of 100 patients with tape-worm, which yields a widely different result from that arrived at by Louis; and far nearer, though still with important differences, that which my own experience would warrant. "Sixty-eight times there were cerebro-spinal affections, and partial or general convulsions (for example, epilepsy, hysteria, melancholy, hypochondriasis, abdominal spasms, dyspnœa, and convulsive coughing), which may even rise to maniacal attacks, and mental weakness; forty-nine times, nausea, even with vomiting and fainting; forty-two times, various pains in the abdomen; thirty-three times, disordered digestion and irregular evacuations; thirty-one times, irregular appetite and voracity; nineteen times, periodical, habitual headach, usually on one side; seventeen times, sudden colic; sixteen times, undulatory movements in the abdomen, up to the chest; fifteen times, dizziness or delusions in the senses, and defects in the speech; and eleven times, shifting pains in various parts of the body." Küchenmeister refuses to ascribe these symptoms to the worm; and his reason is, that even when it has been expelled, they do not disappear. He also quotes, half-approvingly, the Abyssinian belief, that tape-worm only thrives in a healthy intestine. I have already observed that the expulsion of the tape-worm may not take away the verminous malady; and that the vermicide must be held as preliminary only to a course of measures directed against the condition which maintains the existence of the parasite.

Such arguments, therefore, as those of Küchenmeister must be held as inconclusive.

Lebert[a] justly estimates the importance of morbid secretions in the intestinal tube, "which may favour the development of entozoa." It is thus that sick or ill-nourished children present lumbrici more than those in sound condition. Equally, we more frequently meet the tricocephalus in the diseased intestine, in typhoid fever for example, than in the sound digestive tube[b]. There is nothing in reference to the secondary accidents of worms, according to this learned pathologist, more instructive than the material and functional changes that they produce in organs; but he is compelled to admit that "this part of pathology has not hitherto been the object of a sufficiently rigorous observation, and that there is here an unhappy chasm in our knowledge." M. Lebert is himself inclined to take a sceptical survey of these secondary phenomena, though allowing that lumbrici may be the principal cause of choreic or epileptiform phenomena. Dr. Farre[c] has exhibited a just recognition of the nervous phenomena of worms in his excellent essay on this subject. Among their remote influences, he classes "a disordered condition of the cerebral system, as manifested in the frequent occurrence of headach and giddiness, with singing in the ears, disturbed sleep with grinding of the teeth and sudden waking alarm, and the prevalence of somnolency, indolence, or ill-temper. The symptoms have, in some instances, run so high as to cause the case to be mistaken for one of hydrocephalus; but the pain in the head, dilated pupil, convulsions, and other signs imitating the true disease, have suddenly subsided on the removal of the exciting cause"[d]. This author also alludes to trismus, tetanus, and hysteria, and various affections of the senses, as referable to worms, but in classing hysteria as one of the disorders rarely traceable to worms, has underrated its frequency. In the catalogue of symptoms produced by each variety of worm, Dr. Farre has also given a just prominence to the nervous system, but has omitted all mention of tremors, and alluded to aberrations of the senses, only as revealed by "dulness of vision" in cases of tænia.

Dr. Joy[e], while giving an extensive survey of the general symptoms commonly seen in vermination, appears, on the

[a] Traité d'Anatomie Pathologique Générale et Spéciale. Tome premier. Paris: 1857.

[b] Page 400.

[c] Tweedie's Library of Medicine, vol. v. London.

[d] Page 233.

[e] Cyclopædia of Practical Medicine, Article, "Worms."

whole, rather doubtful of their real relation to each other. He was evidently strongly led in this direction by the paper of M. Louis, already quoted, and by the statements of other foreign authors. Among the symptoms which he considers most ordinarily met with in tænia, we find no allusion to the nervous system, with the exception of "heaviness of the head, and a stupid, confused feeling, dulness of sight, though the pupils were natural." Dr. Baillie[a] gives "giddiness" and "occasional convulsions" as the sole nervous phenomena, among the symptoms which he considered indicative of the presence of worms, though Louis never mentions these symptoms. My own experience is here fully corroborative of that of Dr. Baillie, and, I may add, of Heberden.

M. Hippolyte Cloquet[b], though supplying an extended list of symptoms of worms—among the rest, trembling of the limbs and vertigo—omits all mention of nervous symptoms among those he deemed characteristic, with the exception of "dilatation of the pupils." Dr. Joy, looking upon a diagnosis as almost impossible, believing that even the presence of worms in the stools affords no certain proof that they were the cause of the coexistent symptoms, describes the indications of the strumous diathesis, after Rudolphi, as enabling us to guess at their presence without much risk of being mistaken, because these animals "form a very frequent complication in strumous disease." But this surely cannot be deemed a satisfactory method of evading the difficulty.

Dr. Copland has devoted considerable space to the natural history of human parasites, and has levied heavy contributions upon Küchenmeister and Von Siebold, but has described in a very curt manner the symptom produced by them[c]. This is the more remarkable, as he states that "recent writers have been more intent upon the microscopic descriptions of these parasites, and upon drawing minute distinctions, &c., than upon more useful and practical considerations connected with them." The statement of Küchenmeister in reference to ascarides, of both species, that very generally the host and his guests agree very well together, seems to have rather unfortunately affected the usually sound judgment of this admirable author; for, among the symptoms produced by these worms, we find scarcely mention of the nervous phenomena. It is worthy of note, that Dr. Copland says that itching of the anus

[a] The Morbid Anatomy of some of the most important Parts of the Human Body, p. 217. Fifth Edition. London.

[b] Quoted by Dr. Joy in his article.

[c] Dictionary of Practical Medicine, vol. iii., part ii.

is "rare," unless upon the passage of a worm—a statement which is, I believe, well-founded. His account of the symptomatology of tænia is still more unsatisfactory, and still more influenced by the same authority. Seeger's account of this subject, as previously quoted, is given, but Dr. Copland merely observes that "these symptoms are deceptive." In his general view of the symptoms produced by worms in the digestive canal, he allots but a scant place to the nervous system—headach, tremblings, singing in the ears, &c., not being mentioned, though vertigo is given among the signs of a general verminous cachexia.

Heberden[a] has written with his usual sagacity upon this subject, and, whenever copied by subsequent authors, has, in the main, given a proper direction to their statements. After naming the most common parasitic worms of man, he says:—"Mala, quæ ex his oriuntur, quæque his expulsis finiuntur, sunt dolores capitis, vertigo, torpor, somnia tumultuosa, somnus terrore et clamore abruptus, distensiones nervorum, febricula, sitis, pallor, sapor malus in ore, anima fœtida, tussis, spiritus angustus, prurigo nasi, dolores ventriculi, nausea, fastidium, cupiditas cibi nimia, macies, tenesmus, prurigo ani vespere, postremo pelliculæ et mucus dejectus." This admirable description of the results of worms wants but few additions:—"tremores, vitia auditus, tinnitus aurium, muscæ volitantes, perturbationes visus et tota cohors hystericorum affectuum, lassitudo et dolores membrorum"—constitute nearly everything which my experience would enable me to add to it. The order in which the symptoms are arranged is not less worthy of remark. Heberden clearly believes headach and giddiness to be more important indications of worms in general than errors of appetite, or even itching of the nose and anus, and assigns them a much higher place than pain in the belly. He considers itching of the anus, most troublesome at night, to be almost always present in ascarides (thread-worms), and to be the most certain sign of their presence—an opinion with which most persons will be disposed to agree. While fully admitting the importance of the general symptoms of lumbrici and ascarides, he yet declares that sometimes their presence will scarcely be suspected, unless there is either itching of the anus or they are found in the motions. But he says of the tæniæ, or "lumbrici lati," as he terms them, that they bring the gravest evils—"gravissima damna"—upon the body; and alludes to two

[a] *Op. cit.*, p. 214. This author employs the word "lumbrici," as a general term for all worms which infest the interior of the body.

cases which had occurred to him, in which there was reason to suspect a tænia had induced epileptic paroxysms, mania, and fatuity.

It is remarkable that Cullen makes scarcely an allusion to worms in his nosology and in his "Practice of Physic;" the only place in which they are mentioned being under the head of "epilepsia occasionalis," as one of the causes of that affection. I believe the word "vermes" never occurs in Sydenham's works, although he treats of several affections which we might have imagined would have suggested the consideration of worms.

Dr. Marshall Hall[a], in the work least worthy of his fame, in his section on "vermes," ignores the nervous symptoms *in toto*. There are no symptoms which positively indicate the presence of tænia, according to this author. We can only suspect its existence from a sense of gnawing pain in the stomach; give a cathartic, and examine the evacuations! This is the sum of the information given to us by this celebrated writer on the nervous system. Professor Bennett[b] does not allude to the nervous symptoms observed in tænia, in recording the few cases adduced by him in his late important work. M. Grisolle[c] follows Louis closely in his observations on tænia, and therefore pays a higher attention to the local than to the general phenomena produced by the parasite. Dr. Wood,[d] of Philadelphia, has, on the contrary, given an excellent description of the symptoms produced by each variety of intestinal worm, and more thoroughly appreciates the serious nature and frequency of the nervous symptoms than any recent author with whom I am acquainted. He, like M. Grisolle, quotes the results arrived at by M. Wawruch, of Vienna, and which are too valuable to be passed over. During a period of twenty years the Professor had seen 206 cases of tape-worm,—a number sufficiently numerous to warrant positive results. The following is his summary of the symptoms:—Dull pain in the forehead, giddiness, buzzing in the ears; dulness of the eyes, which are surrounded by a dark circle; œdematous eyelids, dilated pupils, frequent and spasmodic movements of the eyes; alternate paleness and flushing of the face, paleness of the lips, peculiar movements of the nose and mouth; emaciation, alternate loss and excess of appetite, cravings for particular articles of food; offensive breath, furred tongue, spitting and vomiting of thin mucus in the morn-

[a] Principles of the Theory and Practice of Medicine, p. 398. London, 1837.
[b] Lectures on Clinical Medicine. Third Edition. Edinburgh, 1859.
[c] Traité Elémentaire de Pathologie interne, tome second, p. 410. Paris, 1850.
[d] A Treatise on the Practice of Medicine, vol. ii. p. 658. Fourth Edition.

ings; itching at the nose, anus, and vulva; grinding of the teeth, especially during sleep; constriction of the throat, swelling of the belly, gurgling, shooting pains, and a sense of pinching about the umbilicus; a feeling in the morning as of a foreign body moving in the bowels; amelioration of all the symptoms under the use of farinaceous food, hot bread, and coffee; finally, depression of spirits, and a train of nervous derangements in protracted cases. "Sometimes," adds Dr. Wood, "the nervous disturbance amounts to convulsive movements of an epileptiform or hysterical character; and when these occur in a man with signs of an abdominal disorder, the possible existence of the worm should be suspected."

This latter remark well deserves to be kept in recollection by the clinical student. In a case presenting the symptoms alluded to, in the absence of the signs of any special brain disorder, the existence of even a few ill-defined disturbances in the digestive functions should arouse suspicion and inquiries relative to the existence of worms.

Bamberger[a], in an essay of great merit, on the worms which infest the intestinal canal, says, that if an individual, particularly in the early periods of life, frequently exhibits a variety of irritation phenomena in the digestive tract, without any very manifest basis, and which are divided from each other by perfectly or nearly free intervals of alternating diarrhœa, constipation, and a normal condition of the intestines; variable condition of the appetite, occasional nausea and vomiting; colicky pains, and unpleasant sensations in the belly, which appear either without obvious cause, or after the ingestion of certain kinds of food. And if, at the same time, there are sympathetic irritation phenomena in other organs, such as itching and burning at the anus, at the genitals, in the nose, leucorrhœa, urinary troubles, dilatation of the pupils, headach, giddiness, and such like, we are led to the presumption that worms are present. This author also specially alludes to the sympathetic and reflex phenomena of tænia, as consisting of itching in the anus and nose, headach, giddiness, hazy vision, and dark spots before the eyes, singing in the ears, palpitations of the heart, cardialgia, increased salivary secretion, vomiting, feelings of faintness, pains in the joints, changed disposition. Bamberger seems to admit spasms and convulsive seizures, like hysteria, to be only observed among women affected with tape-worm. He exhibits an equal scepticism in reference to these latter

[a] Virchow's Handbuch der speciellen Pathologie und Therapie, Band 6, Abtheilung 1, Halfte 2, p. 481. Erlangen.

symptoms in ascaris lumbricoides; and similarly declares that the thread-worm appears never to give occasion to important disturbances—the most frequent symptom by which we are made aware of its presence being itching and burning of the rectum. Admitting the value of this symptom, Bamberger is surely injudicious in thus limiting the symptomatology of this variety of worms. Hasse[a] repeatedly alludes to worms as causes of cramps, epilepsy, eclampsia; and observes that the irritation of worms is commonly received as a source of the last malady. In quoting Moreau's statistics, which showed, out of 240 epileptic women, 20 had suffered from ascarides, three from tape-worm, he remarks that "possibly among many of the patients this circumstance of worms had been forgotten or unheeded" (p. 270). Both Bamberger and Hasse, like Romberg, throw great doubts upon the frequent causation of chorea by worms, in which, as I have before observed, my observations tally with theirs.

Such diverse statements as those now quoted lead naturally to the conclusion that something is yet needed to be added to our knowledge ere a precise recognition of the symptoms and diagnosis of worms will be arrived at. Authors in the last century did, undoubtedly, as stated by Lebert and many others, greatly exaggerate both the frequency and the semeiological value of particular collections of symptoms of the verminous malady. But it is equally true that a reactionary scepticism has thrown into an unjust obscurity these phenomena, and in many instances has denied some of the most ancient and best established facts in medicine. It must be allowed, as I declared at the outset of this memoir, that the zoologist has placed exact knowledge of the natural history of the human entozoa at our disposal,—such knowledge, as admitted by Virchow, as answers "all reasonable expectations;" and it is satisfactory to know that we are not any longer obliged to speak in such disparaging language as our predecessors of the value of anthelmintics,—no one section of Materia Medica having been more singularly enriched of late than this. In spite of this, the knowledge of the symptomatic and diagnostic relations of worms has very manifestly retrograded. It would be, perhaps, more correct to say that this retrogression has, in fact, resulted from the improved natural history investigations; for it is impossible to read many recent authors without observing that the fact of the localized distribution of some varieties of worms—the more or less marked cir-

[a] Krankheiten des Nervenapparates, in Virchow's Handbuch, &c.

cumscription of some of them to particular ages, and the striking frequency of parasites, both entozoal and ectozoal, among numerous classes of the animal kingdom, have tended to induce them to consider these animals as natural to such beings.—Nay, a final cause for their existence has been discovered in their power to reconvert dead and dying matters into living structures—a speculation which can be only characterized as ingenious. These distinguished writers have, however, made a no uncommon mistake in confounding two words of very different signification. A worm, like a disease, may be *peculiar* to a given animal without being *natural* to it. That we must die, is a law of Nature. Any one disease may curtail our life. No one disease, however, is natural to man, though there are several peculiar to him, which attack his existence when his body has been exposed to the required conditions of their development. Among these must be placed the verminous malady.

All recent writers express their surprise that the elaborate apparatus of generation and reproduction among entozoa did not suffice to warn their predecessors of the improbability of the hypothesis of equivocal generation. It may well be so; but I experience a similar surprise that the frequency of the coexistence and of the alternation of several distinct varieties of worms in the same individual, as abundantly shown in my cases, has not strongly directed these writers to the recognition of the great fact that the life of these animals is subordinate to particular conditions of the individual infested by them,—that their natural history, habitat, development, and decay, are in strict relation to special states of that individual. If a tænia lata chooses to infest the intestines of the Swiss, and a tænia solium displays an equal partiality for an English or French system, these worms, at any rate, manifest a marked partiality in their advances, and are liable to be accompanied in either case by such very distant relations, as the ascaris lumbricoides and vermicularis, that we can see no other possible bond of union between the intruders but a common desire and aptitude to live, under certain particular conditions, at the expense of their host.

When we come to analyze the phenomenology of worms, we are met at the outset with a declaration in numerous quarters that the passage of the worm outside the body is the only certain basis of diagnosis. This may be admitted to be true, and yet not allowed to obstruct other inquiries. Here, too, I remark a confusion in the statements of many writers, who ignore, more or less completely, the value of a particular col-

location of symptoms, because a disease is not absolutely characterized by them. But in other branches of medicine, such a mode of exposition would be fraught with danger. When a patient complains to us of loss of power in his muscles, numb feelings in various parts of his body, occasional uneasy, twisting sensations in his abdomen, headach; and when we observe, moreover, that his worn, pale face indicates some profound disturbance in the system, we are led to examine the gums: we find a blue line round their border: we examine the water or the cider he is in the habit of drinking, and we find distinct traces of lead impregnation. But, surely the discovery of these two latter positive indices of saturnine intoxication should not militate against the due estimation of the former array of symptoms, which guided our further inquiries, and brought about an exact diagnosis. It will be very long before physicians examine the gums of every patient submitted to them, and still longer before they subject his ingesta and egesta to chemical examination; and unless we are directed to such and similar investigations by a sagacious appreciation of the less characteristic signs, we shall flounder in error, and overlook the most important disorders. Here, what is necessary is not to expect a pathognomonic sign, but to suspect—to guess, on uncertain, but valuable data. Every one knows the value of a blue line round the gums, when he has found it out. But it is not given to every one to imagine the presence of lead from such and such derangements of the economy. In the great majority of medical cases, a diagnosis is easy, if the thing to be diagnosed is suspected. Physicians differ from each other not so much in what they know, as in what they believe to exist.

Now, I venture to think that there is an arrangement of symptoms in most cases of worms, and more especially in tape-worm, which ought to direct us to the question, Has the patient worms? and, failing a satisfactory reply to this question, should compel us to take the requisite means to arrive at one. I have too often given evidence of my views on this matter in the course of this paper, to render it now necessary to make a detailed exposition of all the symptoms which more or less cogently suggest to the mind the presence of worms, and the fifty cases I have reported are sufficiently explicit as regards my main object. Those who pay an exclusive attention to the digestive disturbances, to the itching of the nose and anus, the foul breath, the varying appetite, will be often right in their diagnostic efforts, whether affirmative or negative, when they have to deal with infantile life, or with the

round and thread-worm; but will be very rarely, indeed, led to a sound conclusion, when their inquiries refer to adult life and to the tape-worm; and this, too, whether in the affirmative or the negative direction. For such troubles are frequently but little marked in tape-worm, and, when present, are wanting in value unless associated with other phenomena. It is in disturbances of the nervous system, associated with these, that we find the best basis for a provisional diagnosis of tænia. When such disturbances, amounting often to convulsive movements of an epileptic form or hysterical character, especially when occurring in a man, coexist with signs of an abdominal disorder, as precisely laid down by Dr. Wood, the possible existence of the worm should be suspected. With this, in the main, Bamberger seems to agree. It should never be forgotten, that in the vast majority of cases of disease which come before us, cerebral disturbances are merely sympathetic[a]; and if these should be well marked, without fever, and with ill-defined, irregular, and alternating digestive troubles, the observer is bound to suspect a foreign body in the intestinal canal, and most probably a parasite.

I have had occasion often to allude to tremors, as occurring in tænia, and have marked the absence of mention of this symptom on the part of almost every author, including the eminently practical Heberden. This could have arisen only from the notion that the symptom is unimportant among so many more obtrusive nervous aberrations. But its frequency is note-worthy, and, in this aspect, deserves to be placed after headach, giddiness, and accidents in the special senses. There is, however, another highly important reason for bestowing a peculiar attention upon the symptom. Tremor is a less common sign in all diseases than cephalalgia or giddiness. It is more frequently connected with a definite pathological basis, and apart from such basis rarely makes its appearance. Now,

[a] Chomel has so wisely alluded to the point that I cannot refrain from quoting his remarks:—"We must first observe, in a general manner, that the two organs which are most ordinarily the seat of sympathetic phenomena are, less often than the other important viscera, the seat of the disease itself. Thus the disorders that we observe in the functions of the brain and of the heart, as cephalalgia, delirium, convulsions even, acceleration of the course of the blood, palpitations, syncope, have, in the great majority of cases, particularly in acute affections, their point of departure elsewhere than in the brain and heart. The great disturbances which supervene in the digestive and respiratory passages are, on the contrary, most commonly connected with diseases of these organs, or of the parts which concur with them in the accomplishment of the same functions. Thus, when I see a patient the subject of delirium, convulsions, a severe cephalalgia, I am induced to seek for their cause in distant organs before questioning the brain; as, in intense fever, I am led first to search its point of departure anywhere else than in the heart."—*Eléments de Pathologie Générale*, p. 484. Par M. Chomel. Fourth Edition. Paris, 1856.

if a patient has not recently suffered from a severe or exhausting malady, is not obviously affected with some metallic poison, shows no other indication of general paralysis, or paralysis agitans; and if, moreover, he is not extravagantly addicted to alcohol or tobacco, we ought to look with great suspicion upon marked trembling of the limbs as probably indicative of worms in the intestinal canal. The semeiological value of this condition is enhanced by the circumstance that it is an objective state, one that cannot be concealed, and which, if simulated, could only deceive the ignorant. I now, in conclusion, place before the reader, in a summary manner, the conclusions at which I have arrived, and which appear to me fairly drawn from my cases.

1. That, in the great majority of cases of tape-worm, and, though with lesser frequency, in cases of other intestinal worms, more or less serious and peculiar nervous disturbances are apt to arise.

2. That the most frequent of these are headach, giddiness, various troubles of the special senses, especially singing in the ears, flashes and dark spots before the eyes, imperfect amaurosis, and trembling of the limbs.

3. That various anæsthetic, and, on the contrary, neuralgic phenomena, are very frequent, usually connected with general lassitude and sense of muscular feebleness.

4. That, though less frequent than those previously cited, convulsive seizures, partaking of the nature of epilepsy or acute eclampsia, or sudden attacks of insensibility, mixed with syncope[a], and, in the female sex, severe forms of hysteria, are also often directly traceable to worms.

5. That the last symptoms (No. 4) are more common in childhood, and the earlier periods of life, than afterwards; and are more frequently caused by the round and thread-worm than by the tape-worm.

6. That chorea does not appear to be often excited by the irritation of worms.

7. That a feeble state of the general health generally accompanies the presence of worms; often, in cases of tænia, proceeding to marked anemia, so as even to lead to the suspicion of the possible existence of Bright's disease.

8. That the irritation phenomena of the digestive tube, even when associated with various symptoms referred to the functions of that tract, do not warrant the diagnosis of the pre-

[a] In his chapter on Lipothymia, Heberden says that "defectio animæ sæpe accedit lumbricis in puerili ætate."

sence of tænia; and that their absence does not absolutely indicate the absence of the parasite.

9. That the frequent appearance of the nervous symptoms above related[a], without a well-marked relation to any special lesion of the nervous system, especially if alternating with periods of perfect or nearly perfect freedom, should engender the suspicion that worms are present. If to those symptoms are added various ill-defined disturbances of the functions of assimilation, including occasional colicky pains, without marked vomiting, pain after food, or decided emaciation,—it is in the highest degree probable that worms are the source of the symptoms, and steps should be taken to obtain assurance of their existence, or the contrary.

10. That it is probable that many of the sympathetic phenomena of vermination are connected, not with their direct irritation of the mucous membrane, with which they are in relation, but with a general disorder of the system, partly resulting from the parasites, and partly the cause of their maintenance and development in the intestinal tract.

Art. VII.—*On the Physiology of Diabetic Sugar in the Animal Economy.* By Robert M'Donnell, M.D., M.R.I.A., F.R.C.S., Lecturer on Anatomy and Physiology in the Carmichael School of Medicine.

Since Professor Bernard, rather more than ten years ago, announced that the liver possessed a sugar-forming function, no subject in physiology has received a more careful examination than that of glucogenesis. In Germany, France, America, as well as in these islands, a multitude of investigators have toiled in this newly-opened gold-field of science, and have brought to light many important facts.

The aspect of the question is now, however, undergoing a change, for recent observations show that there is reason to doubt the truth of Bernard's discovery, which for a time seemed supported by such unequivocal evidence that it had been received as an established physiological fact.

It is proposed in the following paper to endeavour to give a simple, and, at the same time, faithful account of the history

[a] I have left out of enumeration the dilatation of the pupil, as my own observations have not enabled me to speak decidedly of this symptom. But it should be remembered that many judicious authors include this among the symptoms of worms, though denied by Louis in reference to tænia.

and present condition of our knowledge of the origin of sugar, and the changes it is liable to, in the animal economy.

It may be urged by some that details are here entered upon of a too elementary nature, and that facts are cited, and experiments enumerated, which are no longer new to the scientific world. To such it must be answered that this communication is not intended for the perusal of those who have kept pace with the progress of physiological investigation on this subject, but rather of those whose multifarious professional occupations prevent them from searching out for themselves from the immense mass of material which has, during the last few years, accumulated upon this subject, what is substantially true and what is incorrect. Starting then with the simplest facts, it shall be my aim to indicate what accurate information we have on this important subject, and to show, without entering into controversy, how far the careful observations of independent inquirers has yet reached in establishing new truths with reference to sugar in the animal economy.

Some readers will, perhaps, not deem it superfluous if, before entering more directly upon the subject, a few remarks are premised upon the varieties of sugar met with in the organic structures, and the most convenient tests for the detection of sugar in organic solutions.

In the vegetable kingdom several kinds of sugar exist; of these, grape-sugar is, so far as elementary analysis is concerned, identical with diabetic sugar. In animals two varieties only are found—*diabetic sugar and sugar of milk.*

The latter, known also as *lactine*, *lactose*, *salt of milk*, is an essential ingredient in the milk of all mammalia, but is not met with in any other secretion; it readily undergoes change into lactic acid, and, either in the digestive process by passing through the liver, or by the action of dilute acids, is transformed into diabetic sugar.

Diabetic sugar, equally well-known as *glucose*, *grape-sugar*, *sugar of urine*, *liver sugar*(?), *sugar of starch*, *fruit sugar*, is found to exist normally in the animal economy, and in certain morbid conditions makes its appearance in considerable quantities in some excretions. Every one knows that the most striking feature of the formidable disease, diabetes, is the existence of a large quantity of this sugar in the urine; and the same material has been found in the serum of blisters, the sweat, the pericardial serum, &c., of diabetic patients.

The attention of physiological chemists has of late years been so much directed to the "sugar question," that, as a natural result, a considerable variety of tests has been devised for

the detection of saccharine matter in organic solutions. For the benefit of any one wishing to try the various merits of each test alluded to, reference is made to the publication, in which it will be found more fully described. The liquor potassæ test of Moore[a]; the chloride of tin test of Maumené[b]; Boettgers[c] subnitrate of bismuth test, and Loewenthal's test-solution formed with protochloride of iron, may each and all have especial advantages, but by much the greater number of test solutions selected by chemists for the ready detection of glucose belong to the class known as *cupro-potassic tests.*

To this category belong Trommer's, Kletzinsky's[d], Capezzuoli's[e], Donaldson's, Barreswils[f], Fehlings[g], &c., of which, as they will be constantly referred to in the following pages, the two latter may be spoken of at greater length. Besides these, the all important test by fermentation, and the beautiful method of optical analysis devised by M. Biot, and depending upon the action of a liquid containing sugar upon polarized light, deserve special notice.

The test solutions of Barreswil and Fehling are very similar to each other, and are for ordinary purposes the most ready and convenient mode of detecting the presence of diabetic sugar; they have the great merit of not only indicating its presence, but, by a little care, of showing with considerable accuracy the amount of glucose contained in a given quantity of a saccharine solution. Certain precautions, however, are necessary in the use of these test solutions, for, if kept for a considerable period, these liquids undergo a change which causes them alone to yield a precipitate on boiling; it is well, therefore, occasionally to test whichever is employed by boiling it, and so prove that it has not undergone the peculiar change which, causing itself on being boiled alone to yield a copper oxide, would occasion the mistake of supposing sugar to exist in a solution where it was not really present. When the fluid to be tested contains blood, albumen, colouring matter, or any organic constituent of the body, which might interfere with the action of the copper test, such materials are best got rid of

[a] Lancet, p. 751. September, 1844.

[b] Archives Générales de Médécine, vol. xxii., p. 494. 1850.

[c] Zeitschrift der k. k. Gesellschaft der Aerzte zu Wien, September 20, 1858; and Journal de Physiologie, vol. ii., p. 145.

[d] Dublin Quarterly Journal of Medical Science, p. 93. August, 1855.

[e] Journal de Chimie Médicale, p. 359. 1844.

[f] Traité de Chimie Anat. et Physiol., par Ch. Robin et F. Verdeil, vol. ii., p. 570; and Journal de Chimie Médicale, p. 641. 1851.

[g] Leçons de Physiologie Experimentale, par M. Claude Bernard, troisième leçon, p. 49. Cours des Semestre d'Hiver, 1854–5.

by mixing the fluid with animal charcoal, and filtering. Animal charcoal is unquestionably a better means for effecting this object than either acetic acid, or crystallized sulphate of soda, all albuminoid matters, colouring matter of the blood, uric acid, &c., being completely retained on the filter by its aid, and the clear liquid thus obtained being equally suited for either the cupro-potassic or optical tests. Although these test solutions are to be regarded as very valuable, giving indications in general very accurate and delicate, especially when combined with the use of animal charcoal, yet it must be remembered that this reaction does not give an absolute certainty of the existence of sugar; glycerine, tannin, cellulose, chloroform, &c., may produce various degrees of a reaction similar to glucose. Hence the necessity of not relying solely on any cupro-potassic test.

Barreswil's Solution.

	Grammes.	Grains.
Cream of tartar, ...	50 =	771·7
Carbonate of soda, ...	40 =	617·36
Sulphate of copper, ...	30 =	463·02
Potassa cum calce, ...	40 =	617·36
Distilled water, enough to make the whole when dissolved measure one litre (1·76 imp. pint.).		

One hundred cubic centimetres (28 fluid drachms) of this solution are exactly discoloured by one gramme (15·434 grains) of glucose.

Fehling's Solution.

	Grammes.	Grains.
Sulphate of copper, ...	40 =	617·36
Concentrated solution of tartrate of potass, ...	160 =	2469·44
Ley of soda, of specific gravity 1012,	560 =	8643·04
Distilled water, enough to make the whole measure one litre (1·76 imp. pint).		

Ten cubic centimetres (2·8 fluid drachms) of this liquid are precipitated completely by 11·5 cubic centimetres (3·2 fluid drachms) of a solution containing 5 per cent. of glucose.

If either of these reagents be added to a solution containing diabetic sugar in sufficient quantity to produce a decided blue coloration, and the solution be then boiled, the liquid loses its transparency, passes through different shades of green, yellow, &c., and finally deposits a reddish precipitate of protoxide of copper. According, however, as either the sugar or

the re-agent predominates, every intermediate shade of colour, green, yellow, red, &c., may result, but it is the reduction of the metallic oxide, not the precise tinge of colour, which is the important character.

Fermentation Test.—This test, which, as every student knows, acts by causing sugar to undergo vinous fermentation, whereby it is converted into alcohol and carbonic acid, is attended with more certainty than any other. As each equivalent of sugar gives rise to the formation of two equivalents of alcohol, four of carbonic acid; and two of water, it is possible, by estimating the amount of carbonic acid formed, to make use of this as a quantitative as well as a qualitative test for sugar. It is true that it requires a longer time for its reaction to take place than the others, but, on the other hand, it is not interfered with by the presence of those colouring matters, &c., which must be got rid of before the employment of the cupro-potassic reagents.

It is unnecessary to dwell upon the details of this method[a] of detecting the presence of sugar, which are to be found in every hand-book on this subject; but it should not be forgotten that this test does not yield such *infallible indications* as some physiologists would have us believe. Although we are told that the property of fermenting characterizes sugar, inasmuch as sugar is defined as a substance which undergoes alcoholic fermentation, yet it has been recently shown by a chemist of rapidly rising reputation, M. Berthelot,[b] that glycerine, mannite, dulcine, sorbine (substances having many properties of importance in common with sugars, yet not considered identical with them) are also capable of undergoing alcoholic fermentation in the presence of yeast. The yeast used in these experiments should be well washed, so as to be carefully freed from traces of sugar or fecula, and, to avoid error, a comparative experiment should be made with pure water in a tube similar to, and in like circumstances with that in which the liquid being tested is placed.

The method of optical analysis of solutions containing sugar gives evidence of extreme delicacy, for polarized light makes known differences in sugars when chemical analysis fails to detect any. The sugar of fruits causes a deviation of the plane of polarization to the left, while diabetic sugar causes

[a] The directions given by F. W. Pavy, M. B., in his paper on Saccharine Matter, &c., Guy's Hospital Reports, vol. viii., p. 321, in reference to this method, are clear, simple, and practical.

[b] M. Berthelot, sur la Fermentation Alcoolique, Annales de Chimie et de Physique, 3e Serie. 1857.

a deviation to the right. The sugar known to exist in the fluid of the allantois, causes polarized light to deviate to the left like cane-sugar, yet has the other properties of glucose: it ferments easily, turns brown with potash, and reduces the salts of copper.

Although it has been long known (since in 1677 Thomas Willis first indicated the fact) that in certain morbid conditions the urine and other secretions contain sugar, it is only in comparatively recent days that the normal existence of this substance in the animal economy has been pointed out. Since the investigations of Professor Bernard, presently to be detailed, have drawn much attention to the subject, diabetic sugar has been more carefully sought for in the healthy secretions, and has been found existing normally, or at least upon slight disturbances of health, where it was not formerly at all supposed to exist.

Furthermore, it has been discovered that injuries and excitations of parts and organs not hitherto looked upon as immediately connected with diabetes, may give rise to this complaint in a more or less permanent form. To the mind of the scientific physician nothing is more pleasing or more full of practical importance than the study of those conditions where, so to speak, health and disease meet,—where the normal state approaches to, and slight deviations from the normal state give rise to, symptoms which, when exaggerated, constitute formidable disease. Here it is his province to search for the beginnings of disease,—to seek for the early commencement of maladies at first remediable, but at a later period hopeless. Hence the necessity of looking carefully to the presence of sugar in the excretions of health, and hence the value of the experiments which show under what various circumstances the diabetic condition may exist.

Independently of the supposed sugar-forming function of the liver, glucose is found in the blood of animals fed on amylaceous diet; and, according to the experiments of Berard and others on animals fed on meat, sugar formed, as he conceives, during the digestive process enters the animal organism through the absorbents and thoracic duct. It is true that the existence of sugar in the fluid contained in the thoracic duct of a meat-fed animal may be accounted for by some as being derived from the lymphatics of the liver; but Berard has proved the existence of sugar in the lacteals of the mesentery before joining with those coming from the liver. The analysis of Bernard himself and Lehmann prove that the blood may contain sugar even during perfect health ; and if the quantity amount to anything

considerable, the kidneys, more promptly than any other glands, undertake its elimination. We are told—but unfortunately these facts are not supported by the corroborative testimony of all observers,—that the urine contains sugar during fœtal[a] life; that in old age also the urine becomes saccharine; and that in women[b] nursing, or during the later stages of pregnancy, a notable amount of sugar is to be found in the urine. Professor Brücke, indeed, goes further with reference to the existence of sugar normally in the renal secretion. He says, that up to the present time sugar has been sought for in the urine as the symptom of a grave malady. Now, on the contrary, this principle is found to form an element of normal urine. He has published a memoir, in which he has announced the discovery that the presence of sugar is constant in the urine of man in the healthy state[c].

Dr. Hammond[d] has found sugar in his own urine after living for six days exclusively upon starch; but it can hardly be said that this is a normal presence of sugar, nor yet is it the result of disease, although it must be admitted that one could not determine whether the saccharine urine may be the result of the starch diet simply, or of the dyspepsia which resulted from six days of such diet. That disordered digestion is not unfrequently followed by transient diabetes, is well known. So full of interest do these cases of transient diabetes seem, that I cannot refrain from giving Dr. Harley's account of his observations made upon himself, which are both instructive and amusing:—"About five years ago," he says, "at a time when I was much occupied in studying the physiology of diabetes, I regularly tested my urine twice a day, and on one occasion I found it to contain a small quantity of sugar. On the day in question I had partaken freely of asparagus salad, and, thinking that this might perhaps be the cause of the presence of sugar, I determined to try the effects of a greater quantity. The following day, the sugar having entirely disappeared from the urine, I again partook of the same salad both in the morning and afternoon. In the evening, on testing the urine, I found very distinct indications of sugar. As the observation was to me one of great interest, I determined to make some further experi-

[a] Compare Dr. W. D. Moore on the Existence of Sugar in the Urine of the Fœtus, No. 39 of this Journal, August, 1855; and Bernard, Leçons de Physiologie Exper., p. 393. 1855.

[b] Compare the statements of Th. Kirsten of Leipzig, Schmidt's Jahrbuch, vol. xcvi., p. 185; H. Blot, Gaz. Hebd., vol. iii., p. 41, 1856; and E. Wiederhold and Leconte, Schmidt's Jahrbücher, vol. xcvii., p. 14.

[c] Brücke, Journal de Physiologie, vol. ii., p. 338. 1859.

[d] Transactions of the American Medical Association, 1857.

ments on the subject, in order to discover how many hours this state of saccharine urine would continue. During two days I ate large quantities of the asparagus salad, taking care to have it made as stimulating as possible with vinegar and pepper. The result was far beyond my expectations; for, instead of the sugar disappearing from the urine in a few hours after I had ceased partaking of the diet in question, it continued to be secreted during several days, until I at last became very much alarmed lest the disease had been permanently induced. On the evening of the fourth day the sugar had almost entirely disappeared; but on the fifth it returned in increased quantity, so much so, that a drop falling on the boot left a distinct white spot. I could not account for the recurrence of the disease, as I had been particularly careful in my diet during the two previous days. I have mentioned," continues Dr. Harley, "this experiment, because it appears to me that if a flow of saccharine urine be induced in a healthy person—as I consider myself to be—by disordering the digestion and over-exciting the liver, it is very probable that a cause, insignificant in itself, but operating upon a predisposed constitution, might tend to produce the disease"[a].

Sugar in the urine has been found after eating cheese and other substances of difficult digestion. It is worthy of remark that Dr. Jesson, of Dorpat, has rendered horses diabetic by feeding them with hay damaged by moisture. The writer of this Paper has found sugar in abundance in the urine of brewers' horses fed upon "the grains" in the brewery to which they belonged. M. Reynoso has observed sugar in the urine as a result of the internal administration of lead, arsenic, and sulphate of quina; and Leconte, after giving dogs nitrate of uranium, found them diabetic.

Physiological experiment has shown that in animals the diabetic condition may be created by injuring or exciting organs, which might at first seem to be but remotely related to each other. Of these experiments, perhaps the most remarkable is that of Bernard, whereby a puncture made in the middle line of the floor of the fourth ventricle is followed by a flow of saccharine urine.

For the performance of this experiment, it is necessary to perforate the occipital bone with an instrument suited for the purpose, a little posterior to or below its tubercle. The cavity of the cranium having been entered, the animal being now

[a] Harley on the Physiology of Saccharine Urine, British and Foreign Medico-Chirurgical Review, p. 199. July, 1857.

fixed in an exceedingly steady position, the instrument is to be pushed onwards in a direction downwards and slightly forwards, until the basilar bone meets its point; it is then carefully withdrawn in the same direction in which it entered. In this operation the cranium, the cerebellum, and the medulla oblongata are successively pierced; when successfully performed upon a healthy and vigorous animal, the urine is found in a short time after to be strongly impregnated with saccharine matter. The presence of sugar may be detected in an hour, or an hour and a half after the puncture has been made, and may last for a period varying from some hours to some days.

The precise space on the floor of the fourth ventricle where the puncture must be made, in order to produce artificial diabetes, is exceedingly limited; according to Bernard[a], when the puncture is made in the middle line of the floor of the fourth ventricle, exactly in the centre of the space comprised between the origins of the acoustic and pneumogastric nerves, there is an increase of both the hepatic and renal secretions at the same time; if the puncture be a little higher up, there is very often merely an augmentation of the quantity of urine (polyuria without diabetes); if a little below the point indicated, the passage of sugar alone is observed, the urine continuing scanty (diabetes without polyuria).

The mode of producing glucosuria in an animal poisoned with *curara* is, Bernard conceives, explicable by the action of this poison upon the nervous system. Curara is a substance used by the savages of South America to poison their arrows, and has the remarkable property of completely annihilating the functions of the cerebro-spinal nervous system. Although in the present state of our knowledge upon this subject, it may be difficult to give an unhesitating assent to Bernard's explanation of the fact, yet the experiment upon which the fact is based is of a nature so striking that it is given in Bernard's own words:—"We introduced under the skin of the back of a large dog, at the commencement of the digestion, a certain quantity of curara in solution; at the end of twelve minutes the effect of this substance was manifest, and respiration was arrested; artificial respiration was then practised for two hours and a-half, with precaution, and only stopping for half a minute now and then; during this time the circulation continued perfectly right; the blood was black in the veins, in the arteries, arterial red; but it became black everywhere when insufflation ceased. During all this time there was abundant secre-

[a] Leçons de Physiologie Experimentale, p. 339. 1855.

tion of tears and saliva. A wound, which had been made some days previously, in order to collect the pancreatic fluid, and which was beginning to cicatrize, gave exit to an abundant serosity. The urine was examined, on different occasions, without sugar being found there; after two hours and a half it was proved to be present in large quantities. The proportion of the urine was increased, and the muscular contractility was much exaggerated; violent contractions resulted from touching a muscle with the point of a bistoury."

Artificial diabetes may be produced by other means than giving rise to lesions of the nervous system, either by mechanical injury or the action of poisons directly affecting the nervous centres; it may arise from injury or irritation of the liver. Persons have been known to become diabetic from contusions in the region of the liver; and a case has been cited in which an individual who had received a kick from a horse in the right hypochondrium, had, in consequence, saccharine urine, a symptom which disappeared when he recovered from the contusion. Some of the most valuable results which have been obtained in this direction, we owe to Dr. George Harley, of University College. So long ago as during the summer of 1853, he communicated to the Société de Biologie of Paris, the discovery of a new mode of producing diabetes artificially in animals, by means of stimulants introduced into the portal circulation. He has since repeated and extended his experiments, which have been confirmed and somewhat modified by Bernard. Alcohol, ether, chloroform, methylated spirit, or ammonia injected into the portal vein, give rise to the secretion of saccharine urine. Into the portal vein of a good-sized dog in full digestion, Harley injected fifteen drops of liquor ammoniæ, diluted with forty cubic centimetres of water. In twenty-four hours afterwards, on the animal being killed, his bladder was found enormously distended with urine, which not only reduced the copper in the liquid of Barreswil, but fermented most rapidly. It is not necessary that these stimulants should be introduced directly into the circulation by injection into the vena porta to excite diabetes; the same effect is known to result from the injection of stimulants into the intestine simply, and from this experiment we can readily understand how diabetes mellitus may be produced by the abuse of alcoholic drinks in persons predisposed to the disease.

Another mode of causing artificial diabetes has been pointed out by M. Reynoso, which consists in disturbing the function of the lungs by causing an animal to breathe irritating or stimulating vapours; thus temporary glucosuria is consequent

upon the prolonged inhalation of ether or chloroform. In order, however, to induce a flow of saccharine urine, the inhalation must be kept up for a considerable time; and in testing the urine in this, as in other experiments where chloroform is used, it must be remembered that this substance causes the reduction of the metallic oxide in the cupro-potassic solutions; and that, consequently, it is the test by fermentation upon which the experimenter must rely. It must be enough at the present time to state that the repetition of the experiments here given as to the methods of inducing artificial diabetes, by many independent and careful investigators, leaves little or no doubt as to the truth of the facts; but the theories which have been broached, and the hypotheses which have been founded upon these experiments, are as numerous as the individual observers. An analysis of such theoretic views would be out of place.

Let us now consider the question, Does the sugar which is found in certain conditions in the excretions, in various organs, in the blood, &c., come into the animal organization from without? or are there organs in the animal body which can fabricate sugar, no matter what may be the nature of the aliment supplied?

It is not my intention to answer this question, but merely to bring forward what may be regarded as truthful evidence *pro* and *con*. In truth, Bernard's announcement—that nature, not being willing to intrust the animal creation to an alimentation often depending upon accidental circumstances, had placed within the bodies of animals an organ, the liver, which is capable of making sugar from blood—has, since it was first promulgated in 1848, up to the present time, given rise to constant discussion, which seems far from being yet terminated. It has been said already that Bernard's doctrine seemed based upon such unequivocal evidence, the so-called sugar-forming function of the liver has been received and recorded in many of the best hand-books of physiology as an established fact. The acceptation of it, however, was not universal. In 1855, in the "Comptes Rendus" of the Parisian Academy of Sciences, Bernard replies to an attack of M. Figuier, who denied that animals possessed the power of forming sugar, and referred that found in the liver of carnivorous animals to an external source. M. Sanson[a] has upon the same subject ventured to differ from the learned academician, and so lately as last year states his conviction (based upon experimental proof)

[a] De l'Origine du Sucre dans l'Économie Animale, Journal de Physiologie, vol. i. 1858.

that there is but one source of sugar in the animal economy, and that this source is external; and he conceives that carnivorous animals find in the tissues of the vegetable feeders upon which they live the dextrine which is the primitive material from which is formed the sugar necessary for the performance of their functions.

The objections urged against Bernard's views have been made the subject of special investigation by the French Academy; and although the commissioners conceived that M. Figuier[a] had based his arguments on grounds that were untenable, and M. Sanson failed to make good his statement: the question, nevertheless, cannot be regarded as settled, nor can it be said that unanimity of opinion prevails with regard to its details.

Among the researches which cast doubt upon the sugar-forming power of the liver, those of Dr. Pavy[b] unquestionably stand foremost, and are entitled to the fullest consideration. In his communication in Guy's Hospital Reports of last year he tells us that, from a consideration of all the facts brought forward, which in every respect, to the fullest extent, corroborate each other, and which stand uncontroverted by any single result he has yet encountered—he thinks we are unavoidably led to deny to the liver that sugar-forming function, with which, in recent days, it has been endowed by physiologists. In whatever manner subsequent discoveries may solve the difficult problems connected with this question; whether or not it shall hereafter be clearly shown that Bernard was in error in supposing that the tissue of the liver is actually endowed with the power of producing sugar: it must never be forgotten how much is due to the genius of this great experimental inquirer; how many new facts his spirit of physiological research has elicited; how many truths are now to be regarded as permanent scientific acquisitions, which, but for him, would still lie hidden. The vigour of his intellect, the zeal of his pursuit of scientific knowledge, his indefatigable earnestness, his accuracy of observation, have opened so vast a field of inquiry, and have afforded such abundant material for investigation, that to him in justice must be attributed such acquisitions to knowledge as have been evolved from the intellectual fermentation excited by the novelty of his ideas and the originality of his experiments. In fact, to read his own words and follow his own

[a] Comptes Rendus de l'Académie des Sciences, Juin, 1855.

[b] The alleged Sugar-forming Function of the Liver: Guy's Hospital Reports, 1858.

reasonings upon his "Nouvelle Fonction du Foie"[a], points out the necessity of putting in no other language than his own the details of his researches, with such clearness and simplicity are they given.

In the year 1843 the following facts became for Professor Bernard an object of physiological investigation. The strange affection known as diabetes mellitus is characterized by the appearance of a superabundance of sugar in the organism, to such a degree that the blood is surcharged with it; all the tissues are impregnated, and the urine especially contains it, sometimes in enormous quantities. Yet, constantly in such cases, and particularly when the disease is intense, the quantity of sugar expelled by the diabetic patient is quite above that which could be furnished by the feculent or saccharine substances which compose his diet, and the presence of saccharine matter in the blood and its expulsion by the urine are never completely arrested, even at a time when there is absolute suppression of saccharine or feculent aliment.

It was after an attentive examination of these circumstances, observed in diabetic patients, and which are known to all physicians, "that," says Bernard, "I was led to think that there might be in the animal organism phenomena still unknown to chemists and physiologists, capable of giving birth to sugar from other sources than substances containing fecula." Thus led to engage in a series of experiments, Bernard was at first surprised at the unexpected results which he obtained. An adult dog, in vigorous health, was fed during seven days exclusively on meat, of which he ate *à discretion;* at the end of this time he was sacrificed by pithing, while the digestive process was going on. The blood of the hepatic veins was collected in order to search therein for saccharine matter, and great was the surprise of the experimenter when he proved, very readily, and in a manner admitting of no doubt, that there existed a considerable quantity of sugar in the blood, which was going out of the liver of a dog, which, by the fact of his exclusively meat-diet, had been deprived of sugar during seven days. This result was too unexpected and too important to be accepted without scruple. Repetition of the experiment was the only way of removing doubts, and this was done with similar results, and has been done since with like result, by the most skilful physiological experimenters in the New and in the Old World.

[a] Nouvelle Fonction du Foie consideré comme Organe Producteur de Matière Sucrée chez l'Homme et les Animaux : Paris, 1853.

No doubt whatever now exists as to the fact that in animals fed exclusively upon meat for a period even of many weeks, when killed promptly by section of the medulla oblongata, no sugar is found in the blood *entering* the liver by the vena porta, while sugar does exist in the blood *leaving* the liver by the hepatic veins; but this fact has been variously explained by different investigators. M. Figuier has at least the merit of showing that further researches were required regarding the *new function* of Bernard, and the latter consequently engaged in new experimentation, which gave another aspect to glucogenesis. He submitted to careful washing the vessels of the liver of a healthy dog, which had been for some time fed on meat exclusively, and was killed by cutting the medulla oblongata. This was done by passing a stream of water through the liver, entering by the portal, and having exit by the hepatic veins, after traversing the organ. The washing was prolonged until the liquid discharged from the hepatic veins was no longer discoloured by blood, and did not give any evidence of containing either sugar or albumen. This object was accomplished in forty minutes, and then a small portion of the liver examined in the ordinary way was proved to be wholly free from sugar. Twenty-four hours later the fluid dribbling from the liver was found rich in sugar. From this experiment, Bernard concluded that the sugar is formed in the liver at the expense of a particular material by a kind of fermentation; in short, he came to the conclusion, that in the liver of an animal just killed there exists sugar, easily soluble and capable of being washed out of the hepatic tissue; but that there likewise exists in the liver-structure a less soluble material, which remains behind after washing, yet is easily convertible into sugar by the action of some ferment already formed in the liver. Advancing step by step, Bernard found that this material, which was slightly soluble in water, proved insoluble in alcohol, and he struck out the following mode of showing its presence:—The fresh and yet warm liver of a recently killed animal was cut into slices, washed, and then pressed through a hair sieve. The pulp thus obtained was treated with alcohol, until all sugar was removed, and then dried. This pulverized mass, if mixed with water at the ordinary temperature, and let stand for a time, gave evidence of sugar; but, if similarly treated with hot water, and allowed to stand for even a longer time, no trace of sugar made its appearance. Bernard was thus led to surmise that there existed in the liver a substance analogous to amylum, and this substance, he and Hensen, about the same time, succeeded in obtaining

in the pure state. Bernard named it glucogenic substance. Since its discovery it has received a multitude of names, each author conceiving that his own name possessed peculiar merits. It has been called by Hensen, *sugar-forming substance;* by Nape, *amylum;* by Schiff, *liver-starch;* by Pavy, *hepatine;* by others, *glucogene* or *amyloid substance*. If I may venture to offer an opinion upon the subject, I should suggest that the last name be that generally adopted, for, although resembling starch, it is not identical with it. Moreover, in naming a newly discovered substance, probably of high import in the economy, it is not well to involve in that name any theory with regard to its use or function; and, further, it appears from the researches of microscopists of high repute, that a material allied to, if not identical with that in question, is not confined to one organ, the liver, nor one function, that of making glucose; hence the necessity for a name embracing a wide generalization. M. Sanson[a] still insists, and his assertion receives some support from the report of M. Poggiale[b], that "glucogenic matter is met with in all the tissues of herbivorous animals." Bernard, who had already pointed out the presence of a sort of "animal fecula or glucogenic matter" in the muscles and lungs of the fœtus[c], has recently shown that it exists at a particular period in the placenta, and has even given a drawing of the microscopic appearance of the filiform papilla from the amnion of the calf, showing the cells filled with "amylaceous matter;" while M. Rouget[d], in a communication of great value, the first part of which only has as yet been made public, expresses the hope that in the subsequent part of his work he will be able to show that the presence of "amyloid substances," as a constituent part of the elements of normal tissues, is not limited to one single order of animals, nor to a single organ, the liver, among vertebrata, but is common to the elements of many organs; sometimes only during certain periods of their development; sometimes all through life, and plays a most important part in the definitive constitution of the tissues of a great number of the vertebrata.

Whatever name may be given to this substance, whether glucogene or amyloid matter, when obtained from the liver in the pure state, it is a whitish, tasteless, inodorous, neutral, non-

[a] Journal de la Physiologie, &c., p. 104. Janvier, 1859.

[b] Rapport de l'Académie de Médécine sur le Formation de la Matière Glycogene, Journal de la Physiologie, p. 549. 1858.

[c] Sur une nouvelle Fonction du Placenta, Journal de la Physiologie, &c., p. 31. 1859.

[d] Des Substances Amyloides, de leur Role dans la Constitution des Tissus des Animaux: same Journal, p. 85.

crystalline powder, insoluble in alcohol and acetic acids, but soluble in water. It gives with iodine a reaction resembling dextrine, sometimes resulting in a blue, sometimes a dark chestnut brown colour. It does not reduce the copper of the cupro-potassic liquid, nor does it ferment in presence of yeast; but if boiled with dilute mineral acids, or placed in contact with diastase, saliva, blood, pancreatic juice, it is quickly transformed into sugar, which both ferments and reduces Barreswil's solution. Its properties give it a place between starch and dextrine. Pelouze, by the action of fuming nitric acid, has transformed it into xyloidin, and gives for it the formula C_{12}, H_{12}, O_{12}. Injected into the veins of living animals, it is rapidly converted into sugar; and, being eliminated by the kidneys in this condition, gives rise for a time to strongly marked diabetes: and herein there is a prominent point of difference between amyloid substance and the material which it so closely resembles, dextrine,—for the latter remains in the blood for a long time unchanged. Alkalies interfere with and arrest the transformation of this substance into sugar when in contact with saliva, blood, &c.,—a property which will subsequently be seen to be of much practical importance; for by its help the change of this substance into sugar can be promptly arrested by injecting a strong solution of potash through the liver soon after death.

It is of consequence to know what may be the readiest and best means of obtaining the amyloid substance of the liver. Bernard[a] has indicated, in his first memoir upon the subject, the following proceeding for the extraction of "glucogenic matter:"—The liver is to be divided into very thin slices, and immediately placed in boiling water, in order that the glucogenic matter may be prevented from undergoing change into glucose. The pieces of liver are next bruised in a mortar, and then boiled for about an hour, in a quantity of water sufficient to bathe the mass. This is expressed, and the expressed liquid filtered. The liquid thus obtained—which is of an opaline tint—is mixed with four or five times its volume of absolute alcohol, and there is immediately formed an abundant flaky precipitate, of a yellowish-white colour, which is collected upon a filter, and washed several times with alcohol. There is thus

[a] Gazette Médicale, March 28, 1857. It is but justice to state that Hensen, if not prior to, at least independently of Bernard, isolated the glucogenic substance of the liver: in December, 1856, he exhibited this substance before the Naturwissenschaftliche Gesellschaft at Wurzburg; and on the 1st of April, 1857, in Virchow and Hoppe's Pathological Institution. But the French physiologist has the advantage of having first published an account of it, and the manner in which it is to be obtained.

obtained an impure "glucogene," containing azotized matter. Its aqueous solution is coloured by iodine, but does not reduce the cupro-potassic solution, nor ferment in contact with yeast. To free it from the foreign matter which it contains, it is to be boiled for half an hour with a very concentrated solution of caustic potash, and, a little water being added, it is to be filtered. The solution must now be again precipitated by the addition of four or five volumes of alcohol. The deposit, again collected upon a filter, is submitted to repeated washing with alcohol, to remove the potash. The substance thus prepared contains a little carbonate of potash, which is not soluble in alcohol; it is, therefore, indispensable to redissolve the whole in water, saturate the carbonate of potash with acetic acid, and a third time precipitate with alcohol. The acetate of potash remains dissolved in the liquid; the "glucogene," then separated by filtration, is perfectly pure.

Such was the first procedure of M. Claude Bernard. Wishing, however, to shorten the process, as well as to use less energetic agents, he imagined a much more simple means of separating the "glucogenic matter." It consists in pouring a great quantity of crystallizable acetic acid upon a very concentrated and filtered decoction of the organ that one wishes to examine. At once a whitish precipitate separates, which is "glucogenic matter," for the albumenoid substances are soluble in acetic acid. When the organ examined contains no glucogene, acetic acid gives rise to no appreciable precipitate. This procedure possesses incontestable advantages; it readily, and in the space of a few minutes, discovers whether or not glucogenic substance is contained in any given tissue or organ. The acetic acid does not destroy the albumenoid substances, nor expose the experimenter to the risk of forming himself the very substance he seeks for. In this manner is obtained from the liver, in sufficient quantity for chemical examination and physiological experiment, amyloid substance of animal origin, closely similar to, if not exactly identical with, the amyloid substances thus designated by Virchow, and met with by him and others —Meckel among the number—in the parietes of the ventricles of the brain, in the prostate gland, in the degenerated walls of the small arteries of the spleen and intestine, in the liver, kidneys, and lymphatic glands; now also known to exist in the epithelial formation of the fœtus,—not only in the epithelia of its respiratory and digestive passages, but even in that of the skin and its appendages.

It may be, that some may say it is premature to speak of this material as of animal *origin*, yet it seems certain, that an

amyloid substance, having reactions analogous to and being nearly allied with cellulose, starch, and dextrine, is met with widely diffused through the animal organization; that this substance[a], having a particular constitution and special characters, establishes a sort of transition between nitrogenous and non-nitrogenous compounds; between the proximate principles of the animal and those of the vegetable tissues; and, finally, that it may be as justly regarded as having a truly animal origin as the fats and oils of the animal economy.

Yet it must be admitted, that both M. Figuier, and later, M. Sanson, have adduced some important experiments tending to prove that the glucose or the amyloid substance, from the transformation of which the glucose of the animal economy results, is of external origin. It is, no doubt, quite possible, that as the kidney is endowed with the power of laying hold of and eliminating from the blood at each round of the circulation, with inconceivable promptitude, the urea which exists in the blood in barely recognisable quantity, so the liver may be able to lay hold of and store up within itself the amyloid matters, which, in the case of carnivorous animals, can only be introduced into the circulation in the minutest quantities, through the medium of the amyloid substance known sometimes to exist in the tissues of the herbivora.

Without entering into the controversy as to whether it be the special attribute of the liver to form this substance, or to appropriate it when introduced into the system from without, it may be stated to be no longer a matter of doubt, that the hepatic organ during health contains a large quantity of it within its secreting cells. Knowing this, and remembering that extreme facility with which the amyloid substance of the liver is changed into sugar in the presence of blood, the question arises, Does this transformation occur in health and during life, while the circulating blood permeates the structure of the liver? or, is the sugar found in the blood of the hepatic veins in the *primary* experiment of Bernard, the result of post-mortem change? The amyloid substance of the liver being immediately after death transformed into sugar by contact with the blood, a transformation controlled, if not entirely prevented, by the presiding agency of the nervous system during life. The latter view is that taken by Dr. Pavy, and very ably advocated by him in his papers in Guy's Hospital Reports of last year. Deficient in many respects as I feel this communication to be, when I consider the vast amount of labour which has of late

[a] M. Rouget, des Substances Amyloides, *op. cit.*, p. 89.

years been bestowed upon the subject of which it treats; scanty as is the selection made from the abundant supplies of the literature of the subject, yet it would be indeed incomplete were I to pass over the researches of Pavy in silence. They are of a nature curiously interesting and instructive, and exhibit in their author not merely the patient spirit of inquiry after truth, but the all-important quality in a scientific investigator, that of readiness to resign a theory which had been at one time adopted, as soon as new facts are discovered, at first sight unimportant, but which observation shows to be inconsistent with the theory in question. Not to be led astray by foregone conclusions; not to be blinded by an hypothesis based upon even apparently sufficient data; nor too closely wedded to a theory from which it may become almost painful, if not impossible, to be disunited, are principles often with difficulty carried into practice.

I have myself verified most of the conclusions arrived at by Dr. Pavy in his paper "On the alleged Sugar-forming Function of the Liver," in Guy's Hospital Reports, 1858, and have repeated his experiments with various modifications. While, therefore, I offer my testimony as corroborative of the results which he has obtained, I feel it right, in giving a resumé of his researches, to lay before the reader his own account of the experiments which most strongly support the position which he maintains.

It had been the conviction of Pavy, as of Bernard, whose pupil he had been, that sugar was being constantly poured into the general circulation from the hepatic veins, and he was engaged in prosecuting inquiries into the destruction of the sugar thus formed in the animal economy. This destruction he fancied took place in the lungs, and while engaged in some investigations relative to this subject he found it necessary to abstract blood direct from the right side of the heart of a living animal, by introducing a catheter through the right jugular vein into the ventricle. To his surprise he found the blood thus obtained scarcely at all impregnated with saccharine matter; so unexpected was this result, and so much at variance with the views which he at that time held, that he confesses that he was inclined to the opinion that the blood could not have been fairly drawn from the ventricle, or that perhaps it was accidentally derived from the blood of the descending cava, not yet freely mixed with that coming from the liver. These suppositions he was by degrees obliged to set aside, as he found, from a great number of observations, that blood thus obtained yields the merest trace of sugar under an ordinary and natural condition during life; the reaction of Barreswil's solution with it being so slight as sometimes to be overlooked

altogether. In repeating this experiment, I have arrived at results quite in accordance with those of Pavy. If the blood be dexterously withdrawn from the right side of the heart, which is best managed by introducing through the jugular vein a small silver catheter fitted to a pipette, the bulb of which is capable of containing about an ounce, and which has a piece of vulcanized Indian rubber tubing so fixed to it that the blood can be sucked in by the action of the mouth; and if, at the same time, the animal be prevented from making any convulsive movements, scarcely a trace of sugar will be discovered in the serum. But if an animal under precisely similar circumstances, so far as regards diet, be killed by pithing, and, ten minutes after death, an ounce of blood be collected from the right side of the heart and the large veins leading to it by the aid of a catheter introduced after opening the thorax, the serum of this blood will be found rich in sugar.

From a consideration of these and like facts, Pavy was led to believe that the blood issuing from the liver was, during life, either entirely free from sugar or very nearly so; and, further, it occurred to him that the liver might also, during health and life, be free from saccharine matter. This supposition, he admits, so strong was his conviction of the truth of the glucogenic function of the liver, he regarded as in the highest degree improbable. Nevertheless, he determined to investigate further, and, being aware of the presence in the liver of the amyloid substance already spoken of, and knowing the readiness with which this substance is transformed into sugar when in contact with blood and at an elevated temperature, he saw the necessity of adopting some means of arresting this transformation without at the same time destroying the principles concerned.

This transformation may be retarded or entirely prevented by cold or by the presence of an alkali or acid. We have, therefore, within our reach two modes of immediately after death preventing the amyloid substance of the liver from being converted into sugar, as it otherwise will be, owing to the moderately elevated temperature of the animal body and the contact of the blood. These methods consist in, either with all possible expedition reducing the liver to a very low temperature, or injecting into its vessels an alkaline (300 grains of potash in three ounces of water), or an acid solution (300 grains of citric acid in three ounces of water)[a].

[a] The quantities here given are only sufficient for partial injections of the liver. Dr. Pavy prefers the latter, as it acts less unpleasantly on the hands. To obtain the liquid for testing, it is necessary to heat with sulphate of soda, filter, and neutralize. Barreswil's solution can then be used.

The following are the primary experiments of Pavy. A healthy dog, which had been for some time kept under observation and fed upon tripe, but not fed on the day of the experiment, was killed by pithing. The abdomen was instantly opened by free longitudinal and tranverse incisions, and 300 grains of potash in three ounces of water injected through the portal vein towards the liver. The injection was allowed to penetrate only a portion of the liver, a part of it having been firmly held by an assistant to secure it from contact with the alkali. The syringe being removed, and the portal vein ligatured, the non-injected portion was separated from the other before the grasp of the assistant was loosened. The injected part, which was rendered pale and soft, was treated in the following manner, to test for sugar:—A piece, being placed in a mortar, was triturated to a pulp. A sufficient quantity of strong sulphuric acid was cautiously added to neutralize the alkali, and leave a slight acid reaction; by which a solid mass was procured, that yielded a clearish fluid on squeezing in a piece of flannel. This fluid was collected, and rendered alkaline with potash, so as to enable the copper test to be applied. It was found that boiling with the Barreswil solution produced no precipitate of suboxide of copper. The non-injected part, treated with the sulphate of soda according to Bernard's method, gave a most abundant reduction of the copper solution. But in order to render the experiment complete, and show that the treatment to which the injected portion of the liver was submitted had not destroyed the sugar, a piece of that which had not been injected was now pounded in a mortar, with a sufficient quantity of a strong solution of potash to thoroughly saturate it, and allowed thus to remain for about five minutes. It was then treated in the same manner as the injected portion, and, on boiling with the Barreswil solution, gave as strong a reaction as that which had been simply heated with the sulphate of soda. After the injection had been effected, the chest was opened, and the contents of the right ventricle removed. The blood presented a perfectly natural appearance, for the capillaries of the liver appear to give way instead of allowing the solution of potash to pass. On examining the blood according to the usual process, the colour of the Barreswil solution remained unchanged under the influence of even prolonged ebullition.

In performing this experiment, everything depends upon the rapidity with which the injection is effected after the life of the animal has been destroyed. The transformation of the amyloid substance of the liver into sugar takes place so speedily

after death, that, unless the greatest promptitude is exercised, an unsuccessful result is obtained.

The same observations are applicable to the use of cold as a means of arresting the post-mortem production of sugar, and of displaying the condition of the liver natural to life.

If a dog be suddenly killed by destruction of the medulla oblongata, the abdomen at once opened, and a piece of the liver cut off and plunged into a mixture of ice and salt, the post-mortem formation of sugar will be prevented. It is necessary to have recourse to certain precautions, in consequence of the extreme facility with which the sugar is formed after death. The freezing mixture of ice and salt should be ready beforehand, and so far liquefied, that the portion of liver experimented upon may be plunged into it and cooled as quickly as possible. A healthy dog, which had been for some time past kept upon animal diet, and had been fed at $10\frac{1}{2}$ in the morning, was suddenly sacrificed by pithing at 4 P.M. The abdomen was instantly opened, and a piece of the liver cut off and thrown into the freezing mixture. The other portion of the liver, after remaining in the animal some minutes, was removed and submitted to a quantitative analysis. The amount of sugar indicated was 2·96 per cent. The frozen liver was also submitted to analysis; sections through the centre, which remained still soft, contained within a fraction of half a grain per cent. of sugar. The edges and moderately thick outside parings were treated so as to yield a highly concentrated spirituous extract. In this the saccharine impregnation was so inappreciable as to be unsusceptible of quantitative determination.

"The only just inference," says Dr. Pavy, "that I can see to be drawn from these experiments is, that the liver does not enjoy the special functional import that has in recent times been bestowed upon it by physiologists. Such a statement is not incompatible with the result of previous experiments. The conclusions upon which our former notions were based were drawn from results obtainable after death. But it now becomes apparent that we are no longer justified in regarding these results as indicating the condition that belongs actually to life. It is not that Bernard's observations were incorrectly recorded, or his experiments inaccurate, but that hypotheses were based upon them which a more extended examination of the subject has shown to have been founded upon insufficient data."

While admiring the acuteness with which Dr. Pavy has pursued the track which observation of minute results first led him to enter upon, it is a great pleasure to be able to testify to

the accuracy of his observations. To bear witness to the truth of the investigations of others, or raise one's voice against the errors that others may propagate, is a duty as agreeable on the one part as it is invidious on the other. It will be believed, therefore, that it is with real gratification that I, in corroboration of the truth of Dr. Pavy's experiment, give my support, feeble though it be, to the views which he has propounded.

Known facts seem to lead almost irresistibly to the following conclusions :—That the liver exercises a special function in forming a substance, which happens to be with extreme facility, by a process allied to fermentation, convertible into sugar. The material in question (amyloid substance of the liver) is always present in the hepatic tissue in the healthy state. During life and health it seems able to resist transformation into sugar. With the destruction of life, and, as a consequence of certain injuries and diseased states, this power of resistance diminishes, or ceases to exist, and saccharine matter appears in the structure of the liver and in the blood; while, under normal circumstances, the blood circulates through the liver, and escapes charged with, at most, an exceedingly minute amount of sugar.

It has been already observed that the introduction into the circulating fluid of the amyloid substance of the liver is accompanied by the immediate transformation of this material into sugar,—a statement which may be easily verified by injecting some of it into the jugular vein of a living animal, when it at once gives rise to the diabetic condition. In like manner, if any cause—such as a blow over the region of the liver, violent convulsive movements, strugglings during operation, or during the administration of chloroform—so to speak, dislodges from the liver some of its amyloid substance, this material, thus entering the circulation, is changed into sugar; and more or less transient diabetes is the result.

While the glucogenic theory of Bernard was still undisputed, the question of what became of the sugar, which the liver was supposed to be constantly forming, was discussed with much earnestness. This question, of course, loses much of its importance in the present state of our knowledge. Nevertheless, the researches of Pavy[a] himself, as well as the experiments of Limpert and Falck[b], should not be overlooked by those wishing to search into the history of the subject before us. The latter authors have shown that every variety of sugar, when introduced into the blood in moderately large quantity, is in

[a] On the Normal Destruction of Sugar in the Animal Economy : Guy's Hospital Reports, 1855.

[b] Virchow's Archives, 1856; and Schmidt's Jahrbücher, vol. xc., p. 274.

part thrown out by the kidneys. Of cane sugar the most is thus got rid of; of milk sugar, a smaller quantity; and of grape sugar, still less;—the last remaining almost entirely in the body when but a moderate quantity is introduced into the blood.

It is not intended in the present communication to enter into a discussion as to the pathology or treatment of diabetes. Before its pathology can be satisfactorily investigated, the physiology of the subject must be placed upon a firm basis. It is to be hoped that much has been done in this direction; and it is certain that of late years many pathological facts of much importance have been established which, but for physiology, would still remain undiscovered. Andral's pathological facts regarding the production of sugar in the animal economy illustrate in a striking manner some of the views lately adopted by physiologists. The remarkable case which he cites, in which a diabetic patient limited to an exclusively meat diet, and at the time using no amylaceous food whatever, produced more than 20 ounces of sugar daily, would at least seem to show that this material may be abundantly produced in the living organism from nitrogenous compounds.

The observations of the same author on the post-mortem appearances of the liver, in five cases in which he had an opportunity of examining it in diabetic patients; Erichsen's remarks on *surgical* diabetes met with as a result of injury of the head; the coincidence of inflammatory and gangrenous affections of the skin (anthrax, &c.) with mellituria; and the connexion shown to exist between cerebral disease and diabetes: all indicate pathological conditions requiring to be carefully scrutinized before the obscurity which hangs over the diabetic condition can be satisfactorily cleared away.

Admitting that up to the present time science has done comparatively little towards materially bettering the condition of the diabetic patient, or arriving at any definite conclusions regarding the nature of this strange complaint, yet it is most pleasing to see the combined efforts of the chemist, the microscopist, the pathologist, and physiologist, all tending in the same direction, all with one object; nor does it appear unreasonable to hope that the period is not far distant when they will be rewarded by being able to grapple successfully with this formidable malady.

Since the foregoing communication was placed in the hands of the printer, I have received the last number of the "Journal de la Physiologie de l'Homme et des Animaux," containing the conclusion of M. Rouget's admirable paper already alluded to,

and one by C. Bernard on "Glucogenic Matter considered as a condition of development of certain tissues in the Fœtus." These communications will be perused with much interest by those engaged in studying the subject treated of in the foregoing pages. Professor Bernard conceives that in animals, as well as in vegetables, the glucogenic and amylaceous matters seem to be present as a constituent principle of the protoplasma, from the bosom of which the organic evolution is accomplished. He finds that all the epithelial membranes, whether of the cutaneous or mucous surfaces, contain, during a certain period of fœtal life, glucogenic matter, under divers forms. At no period of the organic evolution has he been able to find it in the nervous or osseous tissues. In embryos of sheep and oxen, 15 to 20 centimetres in length, the muscular fibre appears under the form of a tube containing nuclei, and an interspersed granular substance, which is nothing else than glucogenic matter.

Glandular tissue, like that of the nervous and osseous system, does not contain this material, the liver alone, among glandular organs, being an exception.

M. Rouget speaks of amyloid substances as being found in the tissues of vegetables under two principal forms: 1st, contained in a cell, as *amorphous* or *granular starch;* 2nd, in the condition of cell membrane, or intercellular substance—*cellulose*. These have their analogous conditions in the tissues of animals, that variety of amorphous starch met with in the cells of the roots of the dahlia, inula, &c., corresponding to the amylaceous plasma (*zoamyline*), contained in the elements of the tissues of the embryo in the cells of certain epithelium (as of the uterus, vagina, tongue); and, above all, in the cells of the hepatic parenchyma in the adult; while animal cellulose is more abundantly found in the lower regions of the animal kingdom.

Zoamyline is, then, the newest name given to that variety of amyloid substance found by Sanson in the muscles, by Bernard in the tissues of the fœtus and the placenta, and now known to every one to be abundant in the liver, and to exist widely diffused throughout the organic structures.

Art. VIII.—*Clinical Cases in Surgical Practice*[a]. By K. I. O'Doherty, F.R.C.S.I., Lecturer and Demonstrator of Anatomy and Operative Surgery at the Ledwich School of Medicine, and Surgeon to St. Vincent's Hospital.

Resection has occupied so prominent a place in modern surgical literature, that any facts, however small, tending to add to our stock of information on the subject, will not perhaps be unacceptable.

I am therefore induced to detail, shortly, the particulars of the following cases recently under my care: they are of comparatively minor importance, involving, as they did, in each case, the removal of but a small portion of the body; but they present features that may be deemed interesting, if not instructive.

In the numerous contributions to this important branch of conservative surgery with which we have been favoured of late years, attention has been almost exclusively directed to the larger joints: resections of the knee, elbow, hip, and shoulder have become "familiar to us as household words;" the minutest details in reference to them have been dwelt upon, and the young surgeon, familiar especially with the valuable papers of Mr. Butcher, published in this Journal, can be at no loss for guidance in his conduct of them, either as regards the best methods of operating, or the most suitable after-treatment.

When, however, he comes to seek for similar information concerning that larger class of cases he will meet with in which partial disease of the bones of the foot requires his operative interference, he will seek in vain for any established mode of practice to guide him; the consequence is, that we daily witness in hospitals the most varied treatment adopted in such cases.

One surgeon, guided by the precept so strongly inculcated by Dupuytren[b], when protesting against Chopart's operation, "in all such cases to remove only just so much of the foot as the disease imperatively required," has recourse to that seemingly barbarous, and certainly unscientific, because uncertain, proceeding of gouging out the diseased structure.

Again, another surgeon, despairing altogether of eradicating the disease by any such mincing method as this, has recourse to one or other of the bold amputations of Hey, Chopart, Syme, or Pirogoff, any one of which is at the best a sad muti-

[a] Read before the Surgical Society.

[b] Leçons Clinique des Amputations.

lation, especially to the working man, to whom the full use of the lower extremity is always of such vital importance.

The following cases illustrate in a marked manner the success attending the practice of simple resection when applied to remedying the diseases of the small bones of the metatarsus and the phalanges, and go, I think, some way towards indicating this to be the most efficient mode of proceeding in all cases presenting, like them, the features of uncomplicated disease of these small bones or their joints.

Case I. *Resection of Second Metatarsal Bone.*—Patrick Weldon, aged 18, a resident of Drogheda, was admitted into St. Vincent's hospital on the 30th September. His occupation was that of field labourer, and he stated that he had always enjoyed excellent health until about nine months previously, when one day whilst at his work, he felt some pain in his left foot, which was speedily followed by redness and swelling. A few days after, the swelling "burst," giving exit to a free discharge. This discharge continued, and six weeks later a second opening formed more posteriorly. Matters continued in this way for three months, when, seeing no sign of amendment, he sought relief at the Drogheda County Infirmary. It was there poulticed and kept at rest, but, no tendency to heal exhibiting itself, he resolved to come to Dublin.

On examining it, I found the anterior portion of the foot considerably swollen, especially over the situation of the second metatarsal bone, where the integuments were inflamed, and two fistulous openings existed. One of these was situated near the phalangeal extremity of the bone in the second interosseous space, the other near its tarsal end. Upon probing them, carious bone was felt deeply at the bottom of each, and from the direction which the probe took, the disease was clearly indicated as existing in the second metatarsal bone. The most careful examination failed to detect any evidence of its having extended to the neighbouring bones. Although perceptible fulness and tenderness on pressure existed in the sole of the foot, sufficient to induce some doubt as to the limited extent of the disease, yet, as the boy's health was unimpaired, the tarsal portion of the foot as yet unaffected, whilst the general glandular system exhibited no trace of a scrofulous taint, it was deemed a fair case for trial of resection of the diseased bone with its corresponding toe.

Accordingly, this operation was performed on the 16th of October. An incision which commenced at a point a little posterior to the tarso-metatarsal articulation of the second toe

was carried forwards and obliquely outwards, to embrace the fistulous opening in the interosseous space. It was then passed beneath the base of the first phalanx in the usual manner, and carried back obliquely to meet the origin of the wound. The soft parts were then carefully dissected from the metatarsal bone, commencing at its distal extremity, and gradually proceeding backwards. I found it much more difficult than I had anticipated to separate its posterior extremity. Keeping in view the great importance of not wounding, if possible, the large arteries which communicate by the side of the joint formed by it and the cuneiform bones, induced me to be perhaps more tedious in my dissection than was needful. After a good deal of trouble, I succeeded in removing it. The hemorrhage was very copious, as I found it impossible to avoid wounding the communicans tibialis artery and some branches of the deep plantar arch. There was no difficulty experienced in ligaturing them. I allowed the wound to remain exposed for a couple of hours to the action of the air, and then, having carefully removed the clots, I brought the edges as tightly together as I prudently could, by means of long strips of plaster.

I found I was enabled thus to bring the sides of the three anterior fourths of the wound into close apposition. The leg was kept elevated, and the patient treated in the usual way, water-dressing only being kept applied to the wound. He progressed so favourably during the first week that I had no occasion to disturb the parts further than by changing the water-dressing. Upon removing the strips of the plaster on the ninth day, I had the satisfaction of finding the anterior half of the wound healed by the first intention. On the details of the progress of the case since then, it is unnecessary to dwell. A succession of inflammatory attacks had to be combated, from time to time, in the neighbourhood of the wound.

One or two of these were so severe as to cause me some anxiety for the ultimate result. However, they all terminated in the formation of superficial abscesses, which, being opened early, healed without further mischief. I supported the patient's strength with wine, giving him at the same time free doses of quina and iron, and had the satisfaction of finally seeing the inflammatory action altogether subside.

During these critical successions of attacks, three distinct abscesses formed over the outer metatarsal bones, and a fourth opened a way for itself into the sole of the foot: since then, everything has progressed favourably, and I think I may fairly console myself for all the trouble I have had with it, by the reflection that I have left the lad as good a foot as he ever had—a far more satisfactory one than would have been left him had I indulged in my first impulse, to perform Hey's section.

This case appears to me to be of some interest, on account of the rarity of this particular form of resection. I have not, indeed, been successful in discovering, as yet, an account of a similar one which was followed by a favourable result. Mr. Erichsen, in his Surgical Treatise, speaks in very doubtful terms of the success likely to follow the attempt to excise this bone, especially in cases of disease of the kind under which my patient laboured. He deprecates it chiefly on account of the intimate connexion existing between it and the large synovial sac of the tarsus, which almost invariably partakes in the diseased action of the bone. In my case, however, no such complication evidently existed, although an examination of the bone shows that the diseased action had extended back close to the tarsal articulation.

Case II. *Resection of the Metatarso-phalangeal Articulation of the fifth Toe.*—Anne Kelly, aged 16, was admitted into hospital on the 11th of January. She stated that she had always enjoyed robust health until two years ago, when she met with an accident. In rapidly running out of the doorway of her residence, a large nail, which protruded from the doorpost, caught the side of her foot, and inflicted upon her a severe lacerated wound; she suffered much from it at the time, but gradually recovered; the wound skinned over, but continued very tender to the touch; she was able to walk without pain upon it until six months before her admission, when, having occasion to go some distance with a tight boot upon the foot, she found it, on her return, very painful at the site of the old wound; on removing the boot, it swelled, and became again much inflamed. An abscess resulted, which in a few days gave way,

leaving a fistulous opening, that has continued discharging ever since. Lately a second opening made its appearance more posteriorly. She continued, as long as she could, limping about upon it, and endeavouring, by a variety of applications, to induce it to heal. Finding, however, that the inflammation increased, she applied for relief. On examination I found the outer anterior portion of the foot much congested and swollen. On probing the fistulous openings, they were found to converge to the metatarso-phalangeal articulation of the fifth toe, into which the probe readily entered; the joint was completely disorganized.

Her general health was as yet unaffected; the appetite was good; and all her functions were normally performed. No glandular enlargement or other cachectic appearance was discovered. I considered it a favourable case for trial of simple resection of the joint; a form of operation first performed, Fergusson tells us, by the distinguished American Professor Pancoast. A semilunar incision was made, commencing at the proximal end of the fifth metatarsal bone, and extending to the root of the little toe, the convexity being directed inwards far enough to embrace the fistulous opening, which was situated in the fourth interosseous space. A flap was then formed, by turning out the part included within the incision, dissecting it carefully off the bone. The diseased joint was at once exposed; the distal end of the metatarsal and almost the entire of the first phalanx were found in a carious condition. The latter was removed from its articulation with the second phalanx, the articular face of which was unaffected, and the distal third of the metatarsal bone was taken away with a bone nippers; scarcely any bleeding attended the operation. The flap was again laid *in situ*, and the same form of dressing I had found beneficial in the previous case was adopted in this. Strips of soap plaster, of sufficient length to more than surround the foot, bound the parts firmly together, keeping the flap accurately

applied in its proper place; pledgets of lint, moistened with cold water, were applied over the wound, and she was kept, of course, at perfect rest, with the limb slightly elevated. The straps were not removed until the tenth day after the operation, when the wound was found to have healed throughout by the first intention, except at the site of the old sinuses. The subsequent progress of this case so closely resembled the previous one, that but a few words are necessary to describe it. The sinuses continued a long time discharging; occasional slight inflammatory attacks occurred in their neighbourhood, which readily yielded to rest and resolvent treatment. By repeated applications of nitrate of silver, melted upon the end of a probe, and thus conveyed to the bottom of the fistulæ, these latter gradually closed, and a complete cure has resulted. The accompanying woodcut, taken from a sketch of the foot in its present condition, presents scarcely a trace of deformity; the fifth toe, if we except a very slight amount of retraction, exhibiting in no other way the least evidence of its having lost its bony support. She is enabled to run upon it as well as ever.

A striking feature of the operation in this, as well as in the previous case, is that the sole of the foot was left absolutely intact, whilst its breadth was not in the slightest degree impaired. The feet, therefore, remain as perfect organs of support and progression, as if no portion of them had been removed. I may here mention that the boy Walsh continues now, six months after his discharge from hospital, perfectly well, the foot being as useful to him as it ever was, and free from all trace of disease.

Case III. *Resection of a portion of the Tongue with the écraseur.*—Bridget Nugent, aged 19, a healthy-looking girl, was admitted into hospital on the 4th of May, 1858; she stated that for many years she had noticed a kernel, the size of a small filbert, situated at the anterior inferior aspect of her tongue. It had never given her the least pain or annoyance until about a month before her admission, when she began to feel some stinging pains extending from it back towards the base of the organ and parotid region. At the same time she noticed a white spot making its appearance on the surface of it. Finding, after some days, that this spot had increased in size and become fissured, that the kernel itself began rapidly to enlarge, she got frightened, and a severe hemorrhage, which issued from one of the fissures a day or two before her admission, urged her to apply for relief.

When first brought under my notice, the tumour had

attained the size of a small walnut. It was attached by a broad base to the inferior right aspect of the tongue, at the junction of its anterior and middle thirds. It was uniformly hard and smooth to the touch, except upon its free surface, which was fissured and covered with an adherent gray slough; the root, well-defined, seemed lost in the healthy structure of the organ close to its mesian line. When the tongue was drawn in, the tumour, resting in the sublingual space, gave her but little annoyance; but on attempting to speak or masticate her food, the pain became very severe. Her general health was unimpaired. The glands in the neighbourhood of the disease were, to all appearance, perfectly healthy. In carefully examining the nature of the tumour with the aid of the microscope, I had the advantage of being assisted by my accomplished friend, the late Mr. Thomas Ledwich, and, from the appearances exhibited, there seemed no doubt it was a case of epithelial cancer.

A second severe hemorrhage, which occurred a few days after her admission, forced me to active measures, and with the concurrence of my colleagues, Doctors O'Ferrall and Quinlan, I resolved to remove it. I considered it a favourable case for the employment of the écraseur, and accordingly with this instrument the resection was performed on the 10th of the month.

Persuaded of the necessity of avoiding a too hurried section of so vascular an organ, I determined to extend the operation of removal over some hours; and, dreading the amount of pain which would necessarily be inflicted, I had recourse to the expedient recommended by Mr. Hilton, with a view of effectually preventing it. This was to divide the gustatory nerve, on the side intended to be operated upon, as it crossed the floor of the mouth.

I found this by no means so easy a matter to accomplish as I had anticipated from experiments upon the dead body. The free venous hemorrhage caused by the simple division of the mucous membrane over the track of the nerve so embarrassed me in the search for it as to give rise to some delay. Having found it, however, and divided it, I proceeded to use the écraseur in the manner recommended by M. Chassaignac, and which I explained very fully in a notice of the instrument in a previous Number of this Journal.

Having isolated the tumour with a strong ligature, and then tightly fixed the chain round the part, placing it well at the healthy side of the ligature, I had the girl conveyed to bed, and as she lay quietly there on her back, the instrument was

fixed upon a pillow close by, and on a level with her mouth. Every half-hour the constriction was increased by so much as was indicated by a click of the instrument. Dr. Quinlan kindly relieved me at intervals in the performance of this office ; and at 6 o'clock in the evening (the constriction having been commenced at mid-day) the section was completed. A few drops of blood only followed its removal. Immediately after the instrument was removed, the wounded surface of the tongue expanded to its full dimension ; and, as I looked upon it, covering almost one-third the extent of the organ, and found no blood coming from it, I could not but congratulate myself on having employed an instrument that accomplished my purpose in so satisfactory a manner.

The further progress of the case may be summed up in a few words :—No hemorrhage whatever occurred ; a grayish sloughy pellicle formed gradually over the wounded surface. After some days this began to separate at its edges, and as it did so the lips of the wound appeared to contract towards each other. On the 7th of June the last central portion of this pellicle was thrown off; and, within a week after, the only trace of the operation visible was a large notch in the original site of the tumour. The functions of the organ were not in the slightest degree impaired, and she left the hospital perfectly well.

In this case I think it must be conceded that the écraseur performed the section of the tongue in a more satisfactory manner than we could have anticipated from any other instrument or mode of procedure. Having been, I believe, amongst the first to direct the attention of surgeons in this country to the advantages of this instrument, I may be pardoned if I add a few words in defence of what I cannot but regard as a real boon to the operating surgeon in many of the most disagreeable cases requiring his interference. It occurs to me that the discredit into which it has fallen of late has arisen from the fact of too much having been attempted to be made of it. An impartial judge of its merits will, in my opinion, simply regard it as a substitute for the ligature, and, contrasting the action of the two in all those cases in which we consider it advisable to strangle parts in lieu of dividing or removing them with the scalpel, I cannot imagine any fair grounds upon which we can hesitate in recording our opinion in favour of this instrument, possessing, as it unquestionably does, when properly used, all the advantages of the ligature in preventing hemorrhage, with the additional inestimable benefits of being far more rapid in its action, and much less painful.

Its employment in cases of this kind is, I think, especially worthy of our attention, on account of the fatal results which have attended amputation of the tongue performed in the usual way in those recent cases in the practice of Mr. Syme with which we are all familiar. It is true that my case, involving as it did the section of a portion, and that the least vascular, of this organ, will assist us but little in coming to a decision as to the merits of the écraseur in those more formidable ones requiring the removal of the whole or greater part of it. All that I would venture to suggest is, that the results were sufficiently satisfactory to warrant us in giving it a fair trial in those capital cases, before we agree to the dogma of Mr. Syme, that they are to be considered as beyond the reach of our art.

One point very important to bear in mind when employing the instrument is, I think, clearly established in this case. I refer to the necessity of accommodating its action, as it were, to the vascularity of the part operated upon.

I was enabled to remove this tolerably large portion of the tongue without, I might say, the loss of any blood. This I attribute altogether to extending the period of section over six hours, thereby giving ample time for the blood to coagulate in the constricted vessels before dividing them. I entertain no doubt whatever, that, had I divided the parts at once with the instrument, the hemorrhage would have been almost as great as if I had employed the scalpel. I am induced to lay stress upon this from observing that Mr. Skey, in his late work on Operative Surgery, regards this delay as unimportant. I feel, I confess, some hesitation in differing with so distinguished an authority, but until I shall see as large a portion of the tongue removed, using the instrument in this rapid manner, with as bloodless a result as followed the mode I adopted, I shall continue to adhere to the rules recommended by M. Chassaignac. With regard to the section of the gustatory nerve, I must confess I should not be inclined to repeat the experiment, had I again to operate in a similar case, partly because I fear the search for the nerve, as a general rule, will be likely to give the patient almost as much annoyance as the section of the tongue itself, chiefly however, because I am disposed to think it altogether unnecessary. In the case I have detailed, the section of the nerve, I imagine, had little effect in altering the amount of pain produced by the instrument, inasmuch as the section with the latter had to be made very close to the mesian line of the tongue, much closer, indeed, than I had imagined would have been necessary, until I came to fix on the chain of the instrument, and therefore at a part which would

naturally be under the sensory influence of the opposite nerve. That this was so, was evidenced by the amount of pain caused by the first three or four movements of constriction, which was so great as to compel me to employ chloroform to subdue it. After these first few constrictions, however, when in fact the part enveloped by the chain was *strangled*, all sensation seemed to depart, and, during the remainder of the time occupied in the section, she suffered no pain whatever.

Subsequent experience of this instrument in the removal of piles, and other small tumours, in cases in which chloroform was not employed, has tended to confirm in my mind the conviction, first entertained after witnessing the section of the tongue in this case, that the operation of removing or dividing parts with it is comparatively painless, after the parts have been well constricted by the chain of the instrument—a fact which, if verified, it is needless to say, would enlarge to a great extent the sphere of its utility; the great objection to its more general employment at present being the fear of the pain likely to be caused by it, requiring the patient to be kept under the influence of chloroform for a dangerously protracted period.

Art. IX.—*Observations on the Action of the Pancreatic Juice on Albumen.* By Wm. Brinton, M.D., &c., &c. In a Letter to the Editor.

Sir,—Your Number for November, 1858, contained an able analysis of some views lately propounded by Dr. Corvisart, respecting the action of the pancreatic juice on albumen within the living body. The direct contradiction afforded to some of Dr. Corvisart's statements by those of various other observers, published both before and since his elaborate monograph, induces me think your readers may be interested in a brief communication of the result of my own observations on this subject. Without presuming that these observations reconcile all the conflicting statements hitherto made on both sides of this important question, I venture to think that they indicate the cause of some discrepancies; and even in some degree vindicate the accuracy of both Dr. Corvisart and his antagonists. And I may add, that they seem to afford some suggestions respecting the main question at issue, as well as some hints respecting the most profitable direction of future inquiries.

It is chiefly as regards the solvent power of an infusion of pancreas on albuminous substances that Dr. Corvisart and his antagonists are most directly at issue. In the experiments of

Dr. Corvisart, such an infusion dissolves an enormous quantity of albumen, transforming it into a substance akin to peptone. In those of Keferstein and Hallwachs (amongst others), an exactly similar infusion evinces no such power; or only shows, after a long contact with the albumen, a very feeble and scanty solution of this substance—a solution which is precipitable by heat and acids, and is attributable to the putrefaction evidently associated with the solvent process.

The method I generally adopt is to mince a given weight of pancreas very finely, before pounding it to a pulp in a porcelain mortar. Twice or thrice as much distilled water is then gradually added to and rubbed down with the pulpy mass. The whole is then filtered, so as to yield an opalescent (almost milky-looking) fluid, more or less tinged with the casual blood-contents of the gland. With suitable precautions, this fluid is a better and safer (i. e. more uniform) preparation of the pancreas itself, than any solution of the so-called pancreatine which can be prepared from it by precipitation with pure alcohol. Indeed, your readers will, perhaps, gather from what follows that, both in this and other respects, such a simple process has great advantages over that usually adopted by Dr. Corvisart and his antagonists.

If to such an impure pancreatic juice we add a certain quantity (say one-third its weight) of very hard-boiled white of egg, cut into minute cubes (a variety of albumen which, with all its faults, is a more uniform and delicate test of solvent power than any other), and expose the mixture to a steady, even temperature of 101° or 102° Fahrenheit, for four or five hours together, what effect do we observe? Why, perhaps, in a number of experiments, a very variable and uncertain one. Sometimes (like MM. Keferstein and Hallwachs) we may see no solution at all; sometimes (like Dr. Corvisart) a rapid, energetic solution, which dissolves a large part of the albumen present into a liquid which, in respect to its reaction with heat, acids, &c., has many (if not all) of the well known reactions of peptone.

Two circumstances, however, distinguish this solution of albumen from that effected by an artificial gastric juice. One is, that in most cases, and for equal proportions of albumen, the pancreatic solution is a slower process, occupying from two to six times as long a period. The other is, that it is accompanied by unmistakable putrefaction.

To be accurate, however, the latter remark ought to be qualified by the statement, that an energetic solution is often seen to occur, when, as yet, none but a peculiar, penetrating,

quasi-syrupy odour is discernible in the mixture. And though this peculiar smell rapidly merges into a powerfully putrefactive one—always does so long before the solution is saturated with albumen—still we ought not only to be cautious in concluding a direct causation; but may fairly ask, before admitting it, for analogies to such a process of solution by other (even if less rapid and energetic) putrefactive agents and substances.

It is further due to Dr. Corvisart to mention, that there is often a singularly close relation between the quantities of albumen which can be dissolved by a given weight of gastric mucous membrane and pancreas, or pepsine and pancreatine respectively. The numerical proportions are frequently almost identical.

In many cases, heat and nitric acid recover by precipitation a variable proportion of the albumen dissolved by the pancreatic solution. In these cases, however, a further continuance of the process completes the change of the albumen. How far they indicate that the solution and the metamorphosis are two processes, or two distinct parts of the whole process, I cannot at present decide.

Acids and alkalies seem seriously to affect the solvent power of the pancreatic infusion. In proportions of $2\frac{1}{2}$ or 3 per cent. (a proportion in which hydrochloric acid gives its maximum assistance to the solvent powers of a gastric infusion), the acid often hinders any material solution, an effect which is not even suspended by advanced putrefaction of the mixture. The alkali, sometimes indifferent, or even injurious, to the solvent process, generally ends by exalting the power of its mixture considerably beyond that of the pure aqueous infusion, an exaltation which usually concurs with a heightened putrefaction.

But, after all, it is the discrepancy between the affirmation and the denial of the solvent power of the pancreatic infusion which is the most obvious and interesting point for inquiry. An accurate, but unphilosophical observer, meeting with a single well-marked instance on either side, might, perhaps, feel so convinced by what is usually regarded as ocular demonstration, as unhesitatingly to adopt the corresponding opinion. But a careful consideration of such details as those just mentioned, would make even a single instance of the solvent process suggest a more extended and varied inquiry. While the apparently contradictory results which are suggested by such an inquiry, imperatively call for an explanation capable of reconciling them with each other.

It was the close connexion above alluded to, between the

solution effected by a pancreatic infusion and its own putrefaction, which led me to the simple (and apparently satisfactory) observations which reconcile this discrepancy. In a process which concurs with putrefaction, not to say depends upon it, it obviously became of extreme importance to watch the conditions of experiment furnished by the health and condition of the animal supplying the pancreatic infusion; and the time, place, temperature, and other circumstances under which that infusion was made, or to which it was subsequently exposed.

The process of infusion already described, thus seemed peculiarly advisable; not only from the completeness of the solution it afforded, but from the comparatively short time expended in its preparation. The first portions of the filtered liquid could be applied to the digestion of albumen in scarcely more than a few minutes after the death of the animal.

Hence, after finding that the pancreas of the ordinary human corpse showed, in various observations, a solvent power far transcending that of a healthy newly-killed animal, it became my object:—firstly, to exclude all admixture of putrefaction; and secondly, to operate with successive portions of the same pancreatic infusion, in successive stages of putrefaction, or rather of what was necessarily (if not sensibly) a progress towards this state.

During very cold weather, a pancreas weighing 1532·5 grains was removed from the body of a fine healthy sheep instantly after death, and at once minced, pounded, and rubbed down with six ounces of distilled water. Filtered at a maximum temperature of about 42° Fahrenheit, it slowly yielded about $2\frac{1}{2}$ ounces of a milky opalescent fluid; scarcely at all tinged with blood. The solvent power of this fluid was then examined by digesting in it small cubes of albumen at a heat of 102° or 103°. Eighteen hours after death, a six hours' digestion showed no perceptible change in the albumen. Sixty hours after death, another portion of the pancreatic infusion left its albumen unchanged by a digestion of six hours and a half. Five days later, this last portion was again experimented on, in contrast with equal proportions of the clear red liquid and the cloudy granular semi-fluid precipitate, into which the remainder of the original pancreatic infusion had by this time separated, giving off a putrefactive odour. That which had already been digested some hours, at a heat of 103°, took up more than four-fifths of the albumen submitted to it during this seven hours' digestion; the liquid and the sediment (which had both been kept at a maximum temperature of 45°), one-third and one-fourth of their albumen re-

spectively. Lastly, four days later, these portions had acquired such an increase of solvent power as to equal those previously digested. The whole quantity (2½ ounces) thus showed a total solvent power, which may be estimated as corresponding to about 340 grains of moist albumen, taken up by an infusion of 89½ grains of dry pancreatic substance, during from 20 to 26 hours of digestion at 102° Fahrenheit.

From such an observation it is difficult to avoid the conclusions—that the temperature to which the pancreas and its infusion are exposed after death materially affects the solvent power of the latter on albuminous substances; and that it does so by checking or furthering that process of decomposition with which this power is in intimate, if not absolutely causal, connexion. And from exactly similar observations made during such warm moist weather as is now (June 21) prevalent in London, I am entitled to affirm that fifteen hours of this weather, with a temperature of 66° Fahrenheit, can do as much towards setting up the solvent process as a week or more of dry cold easterly wind and wintry weather, at a maximum heat of 45°. That other circumstances capable of modifying this solvent process may also be found in the health of the animal, the disease or injury causing death, &c., I do not at all deny. But into these, my limits will not allow me to enter.

Whatever the exact nature of this process, it seems to be quite specific to the pancreas. I have not only failed to find any analogous solution of albumen effected by infusions of a variety of other tissues; but have especially verified this failure in structures which, like the sub-maxillary and parotid glands, might have been most expected to afford such a parallel; and in cases in which the pancreatic infusion, similarly prepared and experimented upon, possessed its maximum power.

But while I concur with Dr. Corvisart, and various other observers, in assigning to the pancreatic infusion and secretion a great (and if only quantitatively) special power of dissolving albuminous substances, I must demur to the hasty deduction from such a fact, that the pancreas discharges a special function of this kind in the healthy living body. To assume that this solution is a mere casualty of putrefaction, is, I think, neither wise nor accurate. Indeed, the foregoing details not only illustrate the value of much that is still buried in the rich and comparatively unexplored field of the chemistry of decomposition, but they also clearly promise to future researches some definite information on the pancreatic function. But contrasting the process of solution to which they refer, with that effected by the stomach; contrasting its slow, dead, irregular, putrefactive

character, with the rapid and energetic change brought about by an artificial gastric juice, and the antiseptic (I had almost said living) influence this latter exerts on the albuminous matters it dissolves,—I think that the solution of albumen, as a pancreatic function, is a theory which we are quite entitled to reject, until based on other and stronger foundations than any hitherto adduced. Indeed, it may be questioned if there be any proposition which would command a more implicit assent from both the physiologist and the physician than this—that the most distant approach to putrefaction in any of the numerous secretions or contents of the intestinal canal, is proof positive of the absence of health, the presence of disease and decay. Certainly, out of the body, healthy bile, saliva, mucus, and a variety of other substances of the same kind, remain weeks, or even months, at a fluctuating temperature, and yet show no trace of such a change.

Perhaps I ought to add that I have not repeated the vivisections by which Dr. Corvisart further sustains the conclusion thus demurred to. But while they seem open to some doubt, as regards their excluding all reception of gastric juice from the stomach, on the one hand, and all inflammation and decomposition, on the other,—I venture to think that indirect contradiction, which is afforded by the above experiments on the pancreatic infusion, scarcely less valid than a direct denial. In other words, in those secreting organs,—in which whatever can be effected by the elaborated secretion can, allowing for dilution and impurity, be exactly repeated by a properly prepared infusion of the active tissue,—simple and numerous observations on healthy animals, immediately after a sudden and comparatively painless death, seem to me to yield far more trustworthy answers, to inquiries respecting their reactions, than the obscure and uncertain responses which agonized Nature often gives to the "question by torture," as applied by any but the most practised and skilful hands.

I am, Sir, your very obedient servant,
William Brinton.

London, June 21, 1859.

Art. X.—*Cases of Empyema, with Remarks on Thoracentesis.* By Josiah Smyly, A.B., Surgeon to the Meath Hospital, &c., &c.

The propriety of tapping the chest in cases of effusion into the pleura has been called in question by such high authority[a],

[a] See Lancet for November 17, 1855, p. 469.

that I may be excused for bringing forward the following cases. There were others, of which I have taken no record. The first case of the kind I ever operated on was perfectly successful; the effusion was a sequela of small-pox in a boy. Another was sent to me by Dr. Henry Head, and was operated upon in the Meath Hospital; the patient was a young girl, who perfectly recovered.

The result of my experience is, that while I have seen many relieved, and some snatched, as it were, from death, by the operation, I have never seen any injury done by it; while I have to regret cases allowed to perish without this effort to save life being made. One was that of a little boy, whom I was asked to see by a friend. We agreed upon the propriety of tapping. He was cautious, and wished to have another opinion before doing it. The gentleman who was consulted, hearing bronchial respiration, dissuaded from the operation. On post-mortem examination, it was found that the case would have been a most favourable one for it.

With regard to the mode of operating, I never make a previous incision, but, as was first practised by Baron Dupuytren, plunge the trocar and canula at once into the chest. In some cases I have (as in Case V.) used Weiss' grooved needle previously. Although the admission of air is not so injurious as some say it is, viz., Dr. Rebard of Lyons, yet I have generally employed some valvular contrivance, or a gum-bottle and stop-cock, which I have found very convenient.

In Case VII. I applied nitrate of silver to the wound to make the opening fistulous; this did well. I find Dr. Petel[a] recommends the application of caustic potash to the intercostal space some hours previously to opening into the cavity of the pleura; I have found this an admirable method for opening large chronic abscesses, but would prefer applying nitrate of silver to the wound when we wish to make the opening fistulous. I much prefer the application of caustic to the insertion of a tent, or India-rubber tubing.

When the effusion is aqueous, it is generally removed by absorption under repeated blistering, &c., mercury, digitalis, and squills. This case is considered peculiarly unsuited for paracentesis; "the serous cavity," it is said, "is almost invariably changed into a cavity pouring out purulent matter," &c. It is seldom necessary to have recourse to thoracentesis in hydrothorax, but when the oppression of breathing is very great, and the quantity of fluid remains undiminished under active treatment pursued for a sufficient length of time, then we

[a] Gazette Médicale, September, 1840.

should have recourse to the operation, as in Case III.; and, as in that case, may escape the formidable results threatened. In the first operation on this man air got pretty freely into the chest, but no decomposition or change took place in the remaining fluid; neither was there any constitutional disturbance.

Case I. *Empyema following Measles; Thoracentesis; Recovery; Patient subsequently dying of Hydrocephalus.*—J. Neal, aged seven years; in April, 1848, had measles, on recovery from which he had an attack of pleuro-pneumonia. The latter end of August the physical signs of effusion into the right side of the thorax were distinctly manifested; during the month of September he was repeatedly blistered, and mercurials were given. On the 6th of October the right side of the chest measured two inches more in circumference than the left; the liver was depressed; the right side of the chest was dull on percussion, and there was that bronchial respiration heard which so often deceives; the intercostal spaces were dilated; there was no œdema. A trocar, No. 3, was introduced between the fourth and fifth ribs, on a line with the apex of the pit of the axilla; although the trocar was pushed in deeply, and a probe passed through the canula, yet no matter could be got to flow out; the wound was closed.

October 9th. Another attempt was made in a different place, to avoid any adhesion or false membrane, which might have caused the failure as in the first operation. On this occasion two quarts of homogeneous matter were drawn off. This child went on favourably, and on the 24th of December he was quite recovered, and though he had been greatly emaciated, he has now regained flesh and strength.

January 21st, 1849. Some few days ago he was suddenly seized with symptoms of water on the brain, and expired this morning.

Case II. *Empyema; Thoracentesis; perfect Recovery.*—William Smith, aged seventeen years, eight weeks ago was attacked with pleuritis; he has unequivocal signs of empyema of the left side; the heart is displaced to the right; the fluid is presenting in two tumours, one near the sternum, between the cartilages of the second and third ribs, the other just below the nipple. The lower tumour was punctured with a lancet, and a quart of purulent matter was evacuated. Seventeen days after the patient was convalescent; he was able to sit up; the fistula was still discharging; he was extremely emaciated. On the twenty-eighth day after the operation he was going

about, but was very weak. On the forty-first day after the operation he was dismissed cured. He had gained flesh and strength.

This patient was under the care of Dr. Law in Sir Patrick Dun's Hospital, who did me the favour to ask for my assistance in this case.

Case III. *Hydrothorax of five months' standing, successfully treated by Thoracentesis.*—Thomas Flanagan, aged 27, a country labourer, five months ago had an attack of pleurisy of the left side, brought on by exposure to wet and cold. He was actively treated by venesection, &c., but was never free from uneasiness in his side. On his admission into the Meath Hospital there were unequivocal signs of a pleuritic effusion. The left side measured one inch more in circumference than the right; the heart was dislocated beyond the middle line of the sternum. There was no œdema of the integuments, nor protrusion of the intercostal spaces. Various means to promote absorption were tried, such as mercurialization, blistering, &c.; but as these all failed to make any impression on the fluid, Dr. Stokes, under whose care this patient was, proposed to have the chest tapped.

May 11, 1844. The chest was punctured with a hydrocele trocar and canula, without any previous incision, between the seventh and eighth ribs, about their middle, keeping close to the upper edge of the lower rib. Sixteen ounces of a greenish translucent fluid were drawn off. Some air was sucked in, and the fluid ceased to flow out. The canula was withdrawn, the wound closed with adhesive plaster, a compress, and bandage.

June 3rd. The patient expresses himself to have been greatly relieved by the operation. There was no feverish excitement; the left side is tympanitic.

21st. The side having filled to the same extent as before, the operation was repeated. On this occasion a gum-bottle, furnished with a stop-cock, was used to suck out the fluid and prevent the admission of air. Seven imperial pints of the same kind of fluid were drawn off. The next day he was low and weak, and complained of some pain in his left side.

24th. He was stronger and better. A loud splash is heard on succussion.

July 12th. Shortly after the last report, all the fluid was absorbed. He is now perfectly recovered, and about to return home.

Case IV. *Empyema in a case of Phthisis; Thoracentesis, with relief.*—Miss B., aged 18, for some years past has been in a delicate state of health; a year ago had symptoms of consumption, and was seen in consultation by Drs. Stokes, Corrigan, &c.

April 10th. Was attacked with irritable stomach, rejecting

her food, diarrhœa, &c. She was then seen by Dr. Burke, of Molesworth-street, who detected a pleuritic effusion in the left side of the thorax. On the 27th I saw her, in consultation. Blisters, &c., were ordered.

May 11th. The effusion has gone on increasing in quantity. Breathing has become exceedingly laborious and short; she can lie only upon the left side. The heart is pushed up to just under the middle of the left clavicle. The left side measures two inches larger than the right; the intercostal spaces do not protrude, and there is no œdema of the side. Dr. Stokes was now called in consultation. It was agreed to operate, with the view of affording even temporary relief. The thorax was punctured between the fifth and sixth ribs, with a hydrocele trocar and canula, without any previous incision, and five and a half imperial pints of purulent matter drawn off. She bore the operation well.

A few days after, the pleural cavity began to refill, and in a fortnight's time was as full as before the operation. She now began to expectorate purulent matter, and the left side became tympanitic on percussion. She sank gradually, and died on the 14th of June.

She was greatly relieved by the operation. She slept comfortably, and could lie recumbent for several nights after.

Case V. *Empyema after Scarlatina; Thoracentesis; Recovery.*—John Mahon, aged three years and a half. Four months ago had scarlatina; convalescence was slow; had swelled tonsils, &c., and a cough; on the 17th of November, 1842, it was discovered that there was an effusion into the right pleural sac. The side was at first blistered, and after the healing of the skin a turpentine liniment used, and subsequently tartar emetic ointment. Calomel was administered internally, and afterwards mercurial pill and hydriodate of potash in combination. This treatment extended over three months without effecting any improvement in the local affection, while the general health was rapidly declining, and the little patient emaciated to a great degree. The side is painful to the touch, and is œdematous; it measures larger than the other. Dr. Stokes saw this patient in consultation with me, and agreed as to the propriety of tapping.

November 19th. I punctured the side with Weiss' grooved needle, and, finding purulent matter, I enlarged the opening with a sharp-pointed bistoury; having taken seven or eight ounces of matter, I covered the opening with a piece of lint, retaining it in position by a piece of adhesive plaster, so as not to close the wound, but to act as a valve. The child bore the

operation well, and was much relieved. Two days after, the wound was opened, and two ounces of matter discharged. The child was considerably improved in general health and strength, and left the hospital quite cured.

Case VI. *Empyema in a broken-down subject; Thoracentesis, with relief.*—Michael Maguire, aged thirty-four years, has been long labouring under stricture of the urethra and fistula in perineo; on the 27th of December he was seized with rigors, followed by pain in the right side, and other signs and symptoms of pleuropneumonia, to relieve which he was blistered and mercurialized.

February 10th. There being evidence of pleuritic effusion, an exploratory puncture was made with Weiss' grooved needle, but no fluid was discharged.

24th. A fluctuating tumour now presents at the right mamma; a trocar and canula, armed with a valve, was introduced into it, and two quarts of homogeneous purulent matter were drawn off, without any air being allowed to enter the chest.

March 9th. Has been tapped twice since last report, and on each occasion with considerable relief. He now, however, expectorates purulent matter.

12th. Feeling himself sinking, he left the hospital, and, a few days after, he died.

There was no post-mortem examination allowed.

Case VII. *Empyema; Thoracentesis; Recovery.*—On the 18th of September, 1858, I was called to see Miss B., aged five years and a half. She was affected with great distress of breathing, and a loud, croupy, spasmodic cough. These urgent symptoms set in within the last twenty-four hours. She had been ill for a fortnight previously, and was attended by Mr. Finucane, of Blackrock. Her symptoms were those of gastric remittent fever, without any local pain, till the 17th, when she complained of stitch in her right side. Mustard poultices, &c., &c., failing to give relief, I was requested to visit her on the 18th. The posterior part of the right side of the chest was dull on percussion. A blister was applied, and calomel, in small and repeated doses, was ordered. The dyspnœa, cough, &c., went on increasing in severity till the 22nd, when she seemed to be quite in a moribund condition. The operation of thoracentesis was now proposed to her anxious mother, who entreated that her child should be spared a hopeless experiment. She ultimately yielded, on being persuaded that but little pain would be inflicted. A very small trocar and canula, such as is used for exploring tumours, was introduced, without any previous inci-

sion, between the fifth and sixth ribs, and one pint of purulent matter was withdrawn. The following day the little patient was greatly relieved. There was still, however, shortness of breath; great quickness of pulse; and the patient was covered with perspiration.

24th. Patient going on favourably; but the lower part of the right thorax is dull on percussion.

October 1st. An empyema, of necessity, has formed at the place where the puncture was made. This was opened, and two ounces of thick purulent matter were evacuated. The edges of the wound were touched with nitrate of silver, to prevent adhesion.

6th. The fistula has been discharging freely; general health has greatly improved; she takes broth, bread, and milk.

November 30th. The child has been in the habit of swallowing the expectoration; she latterly has vomited up what she had swallowed, and it is quite purulent. Her breathing is good; and the respiratory murmur is heard all over the right side of the chest, which is perfectly clear on percussion.

March, 1859. The fistula remained open, discharging freely for some time; ultimately it closed; the child is regaining strength.

May 16th. I have just seen this little girl. She is in delicate health, and there is reason to fear that disease is forming in the lung. The lower and back part of the right side of the chest is dull on percussion, and the upper part is a good deal drawn in; however, the child goes about, and drives out, and eats her food with appetite.

Art. XI.—*Incisions in Anthrax.* By Maurice H. Collis, F. R. C. S., Surgeon to the Meath Hospital and County Dublin Infirmary, &c.

The incision into anthrax, whether made early or delayed till sloughing has done part of the surgeon's work, must be deep rather than extensive. Usually it is said anthrax is a flat swelling. The fact of its flatness, or rather of its extent, hides the real amount of elevation, which is, in most case, considerable. Hence incisions into anthrax seldom go down *through* the inflamed skin and areolar tissue. But even if they did go down to the fascia, they would fail in effect unless they also went through it. The fascia is highly inflamed in anthrax; in fact the essential difference of anthrax from furuncle consists in the inflammation being deeper and implicating the fascia. When fascia is inflamed, much plastic exudation takes place, both in

its substance and under it; and the tendency of anthrax to spread indefinitely is to be thus accounted for. The pent-up plasma, quickly producing pus and slough, can get no vent until there is an adequate opening in the fascia, and this opening should be made by the surgeon as early as possible, if he would avoid the unpleasantness of useless and repeated cutting, and the extensive sloughing which will occur if he neglect to make it. Plastic exudations find great facility in travelling under the fascia, dissecting and destroying its vascular connexions, and ultimately causing much of it to perish. This is well known, as a general principle of surgery, and it is strange to find it overlooked as the cause of the spread of anthrax. We readily acknowledge the mischief it does in periostitis, in diffused inflammations of erysipelatous character or connected with paronychia, and in many other analogous cases; but books of surgery are, for the most part, silent about it in the case of anthrax. And yet every one must have observed phenomena which can only be explained by it. The extent and mode of extension of the swelling, the real depth to which the surgeon must cut if he is to do good rather than harm, and the fact of large flakes of fascia ultimately coming away as dead core (in addition to areolar tissue), leaving the underlying muscles bare, must have been often observed, and must often, doubtless, have had their influence on the practical observer; but the junior surgeon and the pupil have not been shown their practical bearing. The rule I have given above, to cut deep rather than wide, is founded on the observation of these facts, and will be found satisfactory, saving the surgeon the opprobrium of cutting twice or oftener without benefit to his patient. It is very easy to know when we are deep enough; by taking hold of the flaps made by our crucial incision, we feel if they are quite loose. Our incision is not deep enough unless we can lift up the point of each flap with ease from the parts underneath. This cannot be done unless our knife has gone through the fascia, and made a crucial incision in it almost as extensive as in the skin. The wounds we have made should be almost as deep at their extremities as in the centre, where they intersect. If we have made our incisions early, before actual sloughing has commenced, as we sometimes, though rarely, have an opportunity of doing, the flaps will curl up if the wound is deep enough, and will leave a widely gaping wound; but if we do not see the anthrax until more or less of the skin is undermined and dead, the gaping of the wound will not be so marked, and the best test is the one I have given above, of lifting the flaps with a forceps, and proving that they are loose. If this rule is followed, we shall have few cases in which we must come and cut again.

PART II.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

The History of Prostitution: its Extent, Causes, and Effects throughout the World. (Being an Official Report to the Board of Alms-House Governors of the City of New York.) By WILLIAM W. SANGER, M.D. London: Sampson, Low, Son, and Co. New York: Harper and Brothers. 1858. 8vo, pp. 685.

A SUBJECT that has fruitlessly engaged the earnest attention of legislators throughout all ages, from the days of Moses down to our own time—that has baffled the wisdom of the sages of antiquity, and foiled the power of the Church, no matter at what period of its history, or at whose hands it has been exerted—that affects not only the lord of creation, man himself, from the results that may accrue to him in his own proper person, but that touches him still more home, that cuts deeper still into the most sensitive fibres of his heart, nay, even of his brain, in the manner in which it involves the interests of those dearer to him than life itself: a subject that may involve the honour, the temporal, and peradventure the eternal, weal or woe of mother, sister, or daughter, cannot be treated as one of light importance, or as being unworthy of our most serious and anxious consideration at all times.

The very difficulties that beset the subject, the almost Utopian character of the wish, that is father to the thought, that means should be devised for its palliation, if not for its suppression and extinction, its thorough eradication, as it were, from our sinful nature,—render every step taken in that direction of the utmost importance to the philanthropist, and much more so to the practising Christian. In no one of his attributes does the nature of man more nearly approach to that of his Divine Master than when he is engaged in a labour so congenial to the example set him by Him that was without sin—when he de-

votes himself to the truly noble, the truly charitable and Christian-like task of raising from the ground a sister sunk in shame, and steeped in misery and sin. And, if it be his lot to save that woman from the depths of moral turpitude in which she has hitherto been sunk—if he rescue her from the waves of guilt that threaten to engulf her, both body and soul—if indeed he do succeed in his effort, and she does go forth, and sin no more—then has he nobly vindicated his prerogative as the protector and guide of the sex that looks up to him for countenance and protection, and the feelings that should throb within his breast are such that monarchs on their thrones might well envy him their possession.

Entertaining such views with reference to the merit that attaches to exertions thus put forth on behalf of a unit in that vast sum of human frailty and guilt that disgraces, and has throughout all ages disgraced and defaced God's noblest work, what must be supposed to be our feelings in respect of those who, in a more comprehensive spirit of benevolence, undertake the self-imposed, laborious task of investigating this leprous disease, and probing it to its very bottom, in all its hideousness and disgusting repulsiveness—a task for which they can expect no earthly remuneration at all adequate to the toil that they expend in its execution, and as a requital for which they but too frequently receive an amount of abuse and execration which they can have but little anticipated. In no case is the old adage more strikingly verified than it is in this, that you cannot touch pitch and not be defiled. To do adequate justice to this theme, to trace the evil from its root, the author has to present to his reader an amount of moral filth and abomination for which he cannot by any possibility have been prepared; and though to the pure mind all things are pure, still it is difficult to dissociate in the reader's imagination the author from the actor in these vile scenes; and the greater the vigour, force, and fidelity with which he holds up the mirror to nature, the more likely is he to be accused of pandering to the very *lowest* grade of that vice which he seeks to lash and to hunt out of society. Motives of the vilest and most debasing character are assigned as the true reasons that actuate him in the prosecution of his work; and thus results it that people are actually deterred from undertaking the discussion of a subject, or attempting to suggest a remedy for that moral cancer which is feeding on our people, from the highest to the lowest classes, which is sapping society to the innermost, and seems to acquire renewed vigour and energy as it progresses, blooming and thriving on the ruin it effects around, whilst everything that it touches sickens, withers, dies, and putrefies.

It has been forcibly and happily observed that revolutions are not effected with rose-water: so in our minds must it be with the subject that we are at present considering. To arrive at sound conclusions, we must reason from correct premises, and we can only do so in this instance by examining the history of prostitution from the earliest dates of which we have any record; by weighing well, from the testimony of contemporanous writers, the extent to which it had permeated their society; and by a retrospective consideration of the prophylactic and curative measures adopted in former days, and the comparative success that attended their enforcement, can we alone arrive at what will be likely at our hands, and in the present aspect of society, to, in some degree, mitigate an evil that is crying loudly for redress. Well aware are we of the fact that

> "Every woe a tear may claim,
> Except an erring sister's shame;"

that many exist amongst us, who consider fit justice would be meted out to this subject by passing it over in silence, and by ignoring its very existence. But we ask, in all sober seriousness, in all honour and truth, are the people who would so treat it, the parties by whose conduct we would wish to regulate our lives? Are they not rather people who shudder at the name of a vice which they secretly favour or practise, who seek, at any expense, and by the affectation of some *form* of virtue, to preserve the tattered remnants of a damaged reputation—people who adopt as their rule of life the maxim, "Assume a virtue, if you have it not?" At least our experience is to this effect, and we believe it to be the experience of all who have mixed to any extent in society, and who are at all familiar with the subject of which we treat, that none are so prudish as those who have least reason to be so; none so generous, none so forbearing to an erring sister's shame, as those who require not in their own person a similar consideration. That occasional exceptions may be found to this statement, we care not to deny; but this we boldly assert, that in the vast majority of cases, what we have now advanced as being the fact will be found to be the rule; and, as it is now, so was it of yore, and will be for ages yet to come.

The suggestions at various times promulgated for the relief of this, which in our days has received the not inappropriate term, "the social evil," may be fairly reduced to three heads: 1st. The effort to suppress prostitution by legislative enactment, and penalties levelled against all those who, either for

pleasure or gain, pursue this unhallowed calling. 2nd. The suggestion that the evil may be nipped in the bud; that, in fact, its development may be altogether prevented by the culture of the moral faculties, by elevating the standard of education, especially amongst that class which furnishes the ranks of prostitution with the greatest number of recruits. 3rd. The idea, originating with some of our more practical philanthropists (amongst which number we are proud to rank members of the gentler sex, as remarkable for their strict sense of virtue as for their active benevolence), that asylums should be opened for the reception of such of these unfortunates as, wearied with their life, seek for fostering care and crave admittance within their portals. Under these three heads may all the proposed remedies be classed; for in our opinion it is not just to rank amongst proposed remedies for the evils of prostitution those which aim only at an abatement of the *dangers* that attend on an indulgence in its debasing gratifications, and which propose to afford voluptuaries a safer stage on which to exercise their libidinous promptings. In no other light can we look on provisions that tend only to the *hygienic examination* of women of loose character. What better purpose can it serve (in a moral point of view), than affording a guarantee to those who sacrifice to their passions, that they shall do so with comparative impunity? It is true, that by such provisions we, as far as in human finality lies, secure subsequent generations from having the sins of their fathers visited on them; but to what extent is incontinence *limited* by their enforcement? Therefore is it, we say, that in the consideration of a question of this nature, such proposals should be entirely ignored; and, having arrived at such a conclusion, it remains for us but to discuss what, in our opinion, naturally falls within the scope of our present subject.

Having thus limited ourselves as to the extent within which our observations are to range, let us consider whether we cannot still further reduce these three classes or orders of proposed remedial measures. If we examine them ever so superficially, we shall find that they can be resolved into two great divisions, viz.: 1st. Remedies for the evil as it exists; 2nd. Measures to prevent its future development; and to either or both of them must all efforts be directed which have for their goal the freeing of society from this universally spread plague-spot. We shall now proceed to submit to a more rigorous examination the several panaceas proposed, as they may occur under either the first or second subdivision; and with a due respect to

seniority, we shall commence with those which propose to deal with the evil as it exists; and as, unfortunately, it but too frequently presents itself to our notice.

The treatment proposed for the evil as it exists may be chronologically arranged into two great epochs, the ancient and the modern; the ancient being exclusively confined to such *mild* measures as characteristic dress; deprivation, both in their own person and that of their offspring, of civil rights; rigid seclusion to particular quarters of the city; the rack, tortures, death in the most painful and formidable manner; and, though last, not least, exclusion from participation in the consolation afforded by the last inmate of Pandora's box—hope: as, the terrors of this world being exhausted, sentence of excommunication was repeatedly pronounced against all who persisted in the evil tenor of their way;—and all this, as but too convincingly demonstrated both by history and our own experience, in vain, all in vain; so that we may fairly argue, no matter how else we are to deal with it, prostitution cannot be controlled by legal interdicts or penal enactments.

When we say that it cannot be controlled, we do not wish to be understood as expressing our conviction that legal enactments may not be rendered subservient to the *abatement* of the nuisance; quite the contrary; as, farther on in this article, we may have to express ourselves in quite a different spirit; all that we mean at present to convey is, that the bloody laws of Draco proved as ineffectual in suppressing the evil in former days, as in more modern times the but too frequently timidly expressed sentiment of public opinion has failed not only in killing, but even in scotching the snake. We only intend our remarks here to have an historic value.

The second plan that has been suggested for treating the evil as its exists is, as we have already intimated, to provide asylums for the reception of those who, having strayed from virtue's path, desire to retrace their steps, and, by their conduct for the future, purpose, as far as in them lies, to atone for the errors of the past. This is a method of treatment open to many alleged objections, prominent amongst which may be stated the following:—First and most important of all, that it is not a true remedy, but a palliative; that it strikes not at the root of the evil, but proposes only a partial, and necessarily a very partial means of meeting what, to be successfully encountered, should be prevented from rearing its head at all amongst us. Second, that it holds out, as it were, a premium to vice, by promising that when, no matter from what cause, distasteful, it should receive a succour to which virtue, in its most stern, tried inte-

grity, must ever remain a stranger. Third, that it is a species of recognition by virtue of vice, a recognition in a perfect state of society not to be dreamed of, and in its present condition, according to such cavillers, wholly undesirable. On these and other such objections, we propose further on to comment. We shall now pass on to those suggestions which have for their object the prevention of the development of the vice in any shape—in fact, its radical cure.

Cultivation of the moral and development of the physical faculties are the two great pivots on which turn every plan that has been proposed for the thorough eradication of this vice from the human mind. It has been suggested that a higher order of education, an expansion of the human intellect, a cultivation of the finer feelings of our nature, can only be attended with a corresponding elimination of the grosser and more animal passions that urge us on to sensual indulgence; and if, along with this, we pay a due attention to the development of the physical powers by athletic exercises, it is argued that we have made a great stride in checking an unbridled indulgence in illicit pleasures. Theoretically, this plan has much to recommend it, but has it proved as successful in practice? Is it not a fact—a fact abundantly proved by the detestable revelations in the work before us—that at no periods of history did the enormities of prostitution in its most glaring degree, in its most offensive and heinous forms, exist, than when literature has been most successfully cultivated, and athletic sports constituted a prominent feature of the spirit of the age? At those periods, if we are to believe the testimony of contemporaneous writers, lust, incest, vice in its most repulsive and bestial form, flourished, and shed their baneful light over every ramification of society. We would wish, however, to be understood as confining these remarks strictly to that form of education which has for its sole object the cultivation of the mental, to the exclusion of the moral faculties of the human mind. Hereafter, in speaking of the remedies that are applicable to this social plague-spot, we shall have occasion to point out the important part that a properly constructed system of education will have to play in the future reformation of society.

Dr. Sanger's work is pre-eminently what it professes to be, a history of prostitution. It is divided into thirty-seven chapters, of which thirty-six, occupying 626 pages, are devoted to a description of the vice, as it existed and exists, both in ancient and modern times. Commencing his history from the first periods of which we have any record, he describes the condition of prostitution as it existed amongst the Jews; the vice

is then traced through Egypt, Syria, Asia Minor, Greece, and Rome. The enormous extent of the evil, and the fearful amount of depravity which prevailed, are but too faithfully placed before the reader; and the efforts made for its suppression and the success which attended their enforcement are carefully recorded. He then pursues, in a similar manner, his subject through the early Christian era, through France, Italy, Spain, Portugal, Algeria, Belgium, Hamburg, Prussia, Leipzig, Denmark, Switzerland, Russia, Sweden and Norway, Great Britain, Mexico, Central and South America, North American Indians, Africa, Australasia, West Indies, Java, Sumatra, Borneo, Persia, Afghanistan, Kashmir, India, Ceylon, Ultra Gangetic nations, Celebes, China, Japan, Tartar races, Circassia, Turkey, Northern Africa, Siberia, Esquimaux, Iceland, Greenland; winding up with a very comprehensive consideration of the subject as it affects the city for whose benefit the investigation was originally instituted—New York. Having devoted such a considerable portion of his work to the description of prostitution, as it existed through all ages, and in every quarter of the globe, but one chapter is devoted to what he is pleased to term Remedial Measures, and these are of such a nature as, in our opinion, entirely to justify us in excluding them from any list intended to present to our consideration what are entitled at all to this appellation; the remedial measures proposed being strictly confined to a system of public surveillance, no other remedy being either suggested or discussed. When we have waded through thirty-six chapters of such historical filth and moral turpitude, and find but one chapter devoted to the consideration of remedial measures, and those remedial measures being confined to suggestions for establishing a system of registration, inspection, and police surveillance, we are tempted to exclaim, with Prince Henry—"Oh! monstrous! but one halfpenny-worth of bread to this intolerable deal of sack!"

That such measures may possess great importance in a hygienic point of view, we are free to admit; that they may even have some tendency to prevent the spread of immorality by checking its undisguised exhibition in all its disgusting nakedness, may be also admitted; but that it can do more may be fairly questioned: and at what a price is such a qualified measure of good obtained?—The implied sanction, by a Christian form of government, of a vice that is most degrading to our nature. In our opinion, the very suggestion of such a remedy is insulting to the gentler sex. What right has any government to assume, as assuredly those do who sanction such ar-

rangements, that women were ever intended by their Creator to discharge such vile offices for man, and to provide, by such regulations, for the indulgence of his passions with greater impunity? No: if it be, unfortunately, her lot to fall so low, let not insult of this nature be heaped on her; at least, not until all other means have been fruitlessly exhausted in the effort to save her. If woman is to become guilty, a thing of shame and sin, let not the character of our British legislation be tainted with even an appearance of recognition of such infamy. Whatever other course we adopt, in our opinion that is not the way to meet this most degrading opprobrium of our present social system. No *one* remedy, we think, no matter how active it may be, is capable of checking this disease; it appears to us rather to call for a combination of measures, and many of these may, at first sight, appear trivial and insignificant; but it is from the united sum of them that we may expect to derive some abatement of what is at all hands now-a-days acknowledged to be a foul-spreading ulcer on the fair face of nature; and we shall now proceed to indicate some of those from the employment of which we would expect good results to flow

As we have already intimated, these measures resolve themselves into two great classes:—First, those which propose simply to abate the nuisance as it exists, and which we shall take the liberty of denominating the palliative treatment; second, those which have for their aim the apparently Utopian idea of its entire suppression, and which we shall, therefore, call the prophylactic treatment. From either of these plans we shall exclude, to a very great extent, all coercive legislative enactments and penalties,—for this reason, that they have been repeatedly tried both in ancient and modern times, and as repeatedly have proved signal failures. Any exercise of civil power for which we plead is to no greater extent, and interferes no further with the liberty of the subject, than we constantly see exercised in cases of a far less flagitious nature. In fact, in any suggestion that we now make, we only claim for the protection of the better disposed of our fellow-subjects the powers that are already vested in our civil authorities, and for the due exercise of which they are at the present moment responsible to the voice of public opinion.

In enumerating what we are inclined to term palliative measures, our readers must bear in mind that our sole object is to *mitigate* the evil as it exists, and thereby produce a tendency to its ultimate obliteration. Were we to be understood as proposing to effect a greater amount of good, many objections might be alleged against our suggestions.

It being assumed, then, that any woman has a right to avail herself of that liberty which the law of England assigns as their birthright to the meanest as to the noblest born of her subjects, and that, should she so think fit, she has a right to become a prostitute, the question arises, to what extent has she a right to push this said liberty? Is she entitled to do so, to the manifest injury of her neighbour, and to the utter subversion of good morals and decent behaviour in the neighbourhood which she frequents? Is it not also the fact that at the present moment women of this class *do* insult all sense of decorum amongst the more virtuous members of both sexes, by assembling in groups in our most public ways, and at the most fashionable hours of the day, and making, as it were, at the same time a public confession of, and glorification in, the nature of their calling and extent of their guilt? and this dressed in gorgeous raiment, with every outward trapping of ease and luxury. What other effect can this have on those of their own sex who witness these exhibitions, and at the moment, perhaps, are waging a fearful contest between want, privation, nay, even starvation, and virtue, on the one hand, and what appears to them to be, on the other hand, wealth and all its concomitant advantages,—to be purchased, alas! it is but too true, at the expense of that virtue of which hitherto they have been so careful and so justly proud, but which, if they are to judge from appearances —from the scarcely half-suppressed greetings of fashionably dressed young men, and the but too frequently audibly expressed surprise and admiration of the seemingly more prudent and well conducted of their own sex,—cannot be of such vital importance to them either here or hereafter? Are we demanding too much on behalf of virtue and its supporters and admirers that women of this class should not be allowed to assemble in groups, to obstruct the pathways, to hustle into the causeway the more respectable of each sex, and thus to exhibit themselves in the most offensive and obnoxious manner? For the suppression of this grievous and intolerable evil all that is required is that the police should put in force the powers at present vested in them, and insist on such characters keeping in motion, and not, by remaining any length of time assembled in groups, obstructing our leading thoroughfares, and outraging every sense of public decency. Now, if this be necessary during daylight, it is still more loudly called for at night. Which of us, whose business avocations call him forth at night, is not familiar with the scenes enacted in our streets after dark? In our principal squares, in our leading thoroughfares, around our public buildings, we find groups of these unfortunates (most of them to a

greater or lesser extent intoxicated), who will not permit individuals of either sex to pass them without insult or importunity, as the case may be. How subversive of morality, how destructive to virtue, how suggestive of vice, such conduct must prove, requires not our feeble pen to depict; and for its suppression we only crave the steady exercise of the powers that are intrusted to our city magistrates and our police force. Surely the liberty of the subject does not demand its vindication by the undisputed exhibition of the most unbounded licentiousness at the hands of these pariahs of society.

The next point to which we think the attention of our police force might be advantageously directed is, to put a stop to the system of *solicitation* at the hands of women of this class. Any woman guilty of this practice should be at once arrested, and at all events for that night Satan would have an emissary the less occupied in doing his work. A few examples of this kind would soon establish a wholesome check on this practice; and how much good would thereby accrue, it would be difficult to estimate. Perhaps the police themselves could speak with greater authority than any other party on this point. That great advantage would attend the enforcement of this regulation we are well assured.

The next prevention, however, to which we would wish to draw attention is one around which some difficulties hang, inasmuch as it has attached to it something of the coercive nature of those restrictions that have been so frequently tried, and that have so frequently failed; it partakes also more of the prophylactic than the palliative nature, but as it is to be applied to the evil as it exists, we introduce it here.

What we now allude to is the license assumed by women of this class, in defiance of all respect for public opinion, of all decency or shame, of exhibiting themselves in our most crowded haunts of fashion on horseback or in open carriages. As long as these are their own property, perhaps we dare not, out of respect for the liberty of the subject, interfere; but when we know that those horses and vehicles are supplied to them on hire by parties who pay license for such privileges, we think, perhaps, that the evil might be indirectly met. Men or women who in a drunken state roll about our streets are arrested, fined, and confined. The publican also will not escape censure, perhaps punishment, who supplies drink to parties who have apparently already transgressed the bounds of sobriety. And why is all this? Is it not as much in the interest of society at large, by checking bad example, as it is for the benefit of the wretched drunkard himself? And why should this corrective measure

be limited to intoxication, a mere personal vice, and not be extended to this public display of the success that attends prostitution and its pursuits? Our idea is, that the licensed proprietors of saddle-horses and hackney carriages should have it intimated to them that the supplying of these luxuries to women of this class is contrary to the spirit in which their licenses were granted them, and that a perseverance in such conduct would be taken into consideration as one of the elements in regulating the renewal of such licenses at future periods. We feel that, in suggesting such a course, we are treading on dangerous ground; but so convinced are we of the evil effects produced by such pernicious, unblushing exhibitions after this fashion of successful infamy, that we cannot refrain from urging the adoption of some such line of conduct on the part of our police authorities. That these suggestions are somewhat of a coercive nature we freely admit; still we maintain that their enforcement can be justified even by high legal authority:—"Sic utere tuo ut alienum non lædas" is a precept as sound in law as it should be in morality; and if the exhibition, for the purpose of eliciting alms, of a child in small-pox be interdicted on that principle of law which holds that "salus populi est suprema lex," why may it not be held equally applicable to that far more disgusting and far more infectious disease, prostitution? Blackstone in his Commentaries lays it down that —"there is an implied assent on the part of every member of society that his own individual welfare shall, in all cases of necessity, yield to that of the community; and that his property, liberty, and life, shall, under certain circumstances, be placed in jeopardy, or even sacrificed for the public good." And if this be not considered conclusive enough, we have Sir Edward Coke on numerous occasions stating, that "nihil quod est inconveniens est licitum." In fact, the entire of our legislation seems to be animated with a similar spirit; and an extension of it in the direction we are advocating would be but in accordance with the principles of the British constitution, as laid down by the most eminent authorities. It would be easy to multiply examples of the poisonous nature of displays of the kind to which we have alluded; we shall content ourselves, however, with one such instance, for the authenticity of which we can personally vouch.

One of the most benevolent, noble-minded ladies of our acquaintance informed us that, one day, some years back, on going into her bedroom, she saw her maid straining out of the window, evidently with her eyes pursuing some person in the street. Stealing gently behind her, to her horror she perceived

that the party so observed was one of our most notorious courtezans, gaily attired, and on horseback. She turned to the young girl, who now, covered with blushes and confusion, stood before her, and, seizing the opportunity of dwelling on the enormity of the vicious practices by which such indulgences were procured, she pointed out in kind, but forcible terms, the price that the wretched creature, even in this world, paid for them, and, in fact, left no means untried to remove the impression which she was quick-sighted enough to perceive that the scene had made on her young protegée. In every argument advanced the poor girl acquiesced; she admitted the truth of her mistress' observations, *but turned to her work with a sigh.* The future history of that poor girl is easily summed up. In a very few months she was *said* to have been seduced —we use this form of phrase advisedly, as, in our opinion, her mind had been polluted from that very day to which we have already alluded--she proved pregnant; emigrated to America; resumed there her vicious courses; again became pregnant; and, in a moment of agony, shame, misery, despair, and, it is to be hoped, of madness, committed, with the assistance of strychnia, the double crime of suicide, and, in the person of her unborn babe, of murder. We ask, in all honour and conscience, at whose door do that poor girl's guilt and untimely fate lie—who, unconscious though she may be of the fact, should be held morally responsible for her vices and her crimes?

Turning from the contemplation of so painful a case, the next question to which we would wish to direct attention is that which has for its object the reclaiming of such women as, alas! have forfeited their claim to their own self-respect, and that of the more virtuous of either sex—which proposes to gather again within the fold those straying sheep—which, in fact, allows a gleam of hope to cast a reviving ray over what must have been hitherto utter, impenetrable, despairing darkness. If it be true, as assuredly it is, for we have it on the authority of one to whom falsehood was a stranger, that "joy shall be in heaven over one sinner that repenteth, more than over ninety and nine just persons, which need no repentance," then, indeed, are they blessed who minister in the cure of our erring, frail sister to her regeneration. Can any reflection be more horrible, more harrowing, to a properly constituted mind, than that one of these unfortunates should be compelled for a single hour to pursue her unhallowed career after she feels a sickening repugnance to her calling—after that her heart is aroused to the sense of the peril in which she has hitherto existed—after that

her soul thirsts for living waters, and that she craves to "go forth and sin no more"? That provision should be made for her present protection and future support, under such circumstances, is but a practical recognition of the truths of Christianity, and, in our opinion, no more has a tendency to foster such crimes than hospitals are likely to encourage people to fracture their legs, or to run the risk of catching small-pox. We also are of opinion that every exertion should be made for the organization of many of such asylums, and that access to them should be of the readiest nature. *Small* institutions favour more careful supervision of each case, more intimate knowledge of the individual character, facilitate the detection of imposture, or the dangerous tendency to relapse; whilst easy access allows us to take advantage of the first glimmerings of conscience, and thereby fosters a feeling which, though in the commencement small as a grain of mustard-seed, may bring forth a tree of goodly stature, bearing the fruit of righteousness. That our views are not extravagant may be inferred from an examination of the Report of an institution founded on these principles in this city. We allude to the Fourth Annual Report of Dublin by Lamplight, for the present year, and from which we shall extract a Table which sums up in one line the past year's progress:—

Refused.	Applied	Admitted.	Emigrated and restored.	Went out.	Dismissed.	In the House.
67	130	63	18	3	15	40

In our minds the salient feature in this table is the fourth column, from which it will be observed that EIGHTEEN unfortunate females have been rescued from a life of sin and shame, have been restored to themselves and to society; or, in other words, that one-fourth of the entire number of the cases under treatment have had a fresh page of life's book opened for them, —a page which we trust, with God's blessing, will not be sullied with any future record of infamy or incontinence.

To those who would suggest our poor-houses as fitting asylums for such of this class as may wish to reform, we would simply reply that they cannot have considered the case at all. Why should the virtuous pauper be subjected to the contamination of such associates? Any one who at all understands the constitution of such institutions, must know well that the admission into them of such characters is as destruc-

tive to the morals of its previous inmates, as it is unlikely to be attended with beneficial results in the reformation of the class for whose use we would wish to see reformatories established; for the treatment of such cases as these, we are of opinion that isolation is absolutely as essential for the patient's welfare as for that of the public.

Having in this imperfect manner given expression to our views as to the remedial measures, or at least a portion of them, that are applicable to the vice *as it exists*, we shall take a hasty glance at what we have ventured to designate the prophylactic means at our command for the abatement of the evil for the future—its entire suppression, at all events as society is at present constituted, being unfortunately, in our opinion, a consummation that is impracticable, no matter how much it is to be desired.

Measures of this kind, to be at all successful, must be directed not only towards the female, but also the male sex; and prominent amongst them for both sexes we would place education, not as we understand it in the ordinary acceptation of the word, and for which we would substitute the term accomplishments; but education on a sound moral and religious, as well as mental foundation. Education that aims only at the *refinement* of the female mind, especially the minds of those that constitute what is termed the lower orders, is but too frequently developed at the expense either of their happiness or their honour, or of both; their sensitive nature makes them shrink from communion with the coarser spirits around them; they crave the society of people of the opposite sex more on an *intellectual* equality with them; then that *besoin d'aimer* comes into play, and so they fall—fall as a consequence of that very measure which originally was intended for their elevation. That we speak not from vague theory, and unsupported by other evidence than our own, we shall prove by quoting from the writings of one whose works do honour to her sex. In "A Woman's Thoughts about Women," we read the following remarkable passage:—

"Another fact, stranger still to account for, is that the women who thus fall are by no means the worst of their station. I have heard it affirmed by more than one lady, by one in particular, whose experience is as large as her benevolence, that many of them are of the very best, refined, intelligent, truthful, and affectionate. 'I don't know how it is,' she would say, 'whether their very superiority makes them dissatisfied with their own rank; such brutes or clowns as labouring men often are! So that they fall easier victims to the rank above them:

or whether, though this theory will shock many people, other virtues can exist and flourish, entirely distinct from and after the loss of that which we are accustomed to believe the indispensable prime virtue of our sex—chastity. I cannot explain it; I can only say that it is so; that some of my most promising village girls have been the first to come to harm.'"

No! education, to prove of service in this cause, must not be of this nature; it must be practical, and above all, it must have its foundation on the Rock of Ages. One of the most remarkable passages in Dr. Sanger's work is that which we shall now submit to our readers, and in which, after having previously given us a fearful picture of Pagan profligacy, he bears honourable testimony to the teaching, in this respect, of our Christian faith, and the fruit which it bore. The passage is as follows:—

"Perhaps the most marked originality of the Christian doctrine was the stress it laid on chastity. It has been well remarked that even the most austere of the Pagan moralists recommended chastity on *economical* grounds alone. The Apostles exacted it as a moral and religious duty. They preached against lewdness as fervently as against heathenism. Not one of the Epistles contained in the New Testament but inveighs, in the strongest language, against the vices classed under the generic head of luxury. Nor can it be doubted that, under Divine Providence, the obvious merit of this feature in the new religion exercised a large influence in rallying the better class of minds to its support.

"From the first, the Christian communities made a just boast of the purity of their morals. Their adversaries met them on this ground at great disadvantage. It was notorious that the College of Vestals had been sustained with great difficulty. Latterly, it had been found necessary to supply vacancies with children, and even under these circumstances, the number of Vestals buried alive bore but a very small proportion to the number who had incurred this dread penalty. Nor could it be denied that the chastity of the Roman virgins was, at best, but partial, the purest among them being accustomed to unchaste language and unchaste sights. The Christian congregations, on the contrary, contained numbers of virgins who had devoted themselves to celibacy for the love of Christ. They were modest in their dress, decorous in their manner, chaste in their speech. They refused to attend the theatres; lived frugally and temperately; allowed no dancers at their banquets; used no perfumes; and abstained generally from every practice which could endanger their rigorous continence. Marriage among the Christians was a holy institution, whose sole end was the procreation of children. It was not to be used, as was the case too often among the heathen, as a cloak for immoralities. Christ, they said, permitted marriage, but did not permit luxury. The early Fathers imposed severe penitences on fornication, adultery, and other varieties of sensuality."

Having thus provided a proper religious foundation, and without which all else will prove vanity and vexation of spirit, we should proceed to raise upon it a fitting educational superstructure, and in the case of individuals of our humbler classes, this should be of the soundest and most homely nature: reading, writing, arithmetic, (it will be remembered that we are still speaking of the female sex) needle-work, familiarity with domestic duties,—an honest preliminary education to fit them to fill that station to which it has pleased the Lord to call them; in fact every effort should be made to educate them in such a manner as to qualify them as servants to discharge their duties towards their employers; and as the poor man's wife towards their husbands. No one can have any idea, but one of our own or of the clerical profession, of the hours wasted from an actual ignorance of how better to employ themselves, by the females of the lower classes, of the squalid filth and misery that pervade their abodes,—all from the neglect of their early education. The boon that would accrue to themselves and their families, were they fitted to assist their toiling husbands in their struggle for their daily bread, is too self-evident to require any further notice at our hands.

Every writer on this subject lays down, as one of the temptations to prostitution, the inordinate love of dress in the female mind. Granting this to be the case, would not such an education as we have here feebly sketched be calculated to abate one contingent of this abominable leprosy. Skilled labour will always prove more profitable than unskilled labour, no matter how energetically put forth the latter may be; and the more useful the members of the more humbly born class of females can prove themselves to be, the better will their services be requited, and the less necessary will it be for them to have recourse to such degrading practices to gratify this taste.

The same arguments apply to this class of prostitutes (more to be commiserated than censured), who have been coerced to such courses in order to support an aged and infirm parent, a dying brother, or, more painful still, to procure bread to stop the cries of a famishing child; human nature must shudder in recording such causes amongst the statistics of prostitution; that such have occurred, is but too true, and the cognizance of such facts should make the moralist blend pity with his disapprobation, and mercy with his judgment.

These and many other such allied considerations should weigh with the notable housekeeper in determining the scale of remuneration that she proposes to adopt for the services of those whom she employs. Few are they who would count it

as a gain of which to be proud, the economy exercised at the cost of a sister's misery. Yet, if they reflect at all, they must know well that it is absolutely impossible to support one human being, much less the family that may be depending on that human being's overtasked exertions, by the stipend but too frequently allotted to them for their day's work. Whence, then, is the deficiency to come? That, depend upon it, is a question that they will have to answer to their own consciences on some future day.

Presuming, however, that we have discharged our duties in these respects to the female sex, are we then *functus officio?* Far from it; man, the tempter, with all his strong passions, his want of self-control, his selfish desire to gratify his lust at any expense, at any cost, remains to be considered; his reformation must be also attempted, or our work is but half accomplished. This task must be commenced in the cradle, and will only be concluded as he quits this world to account in the next for the talents with which he has been intrusted. For, much to the shame of our sex be it stated, that monsters are to be found amongst us whose head indeed, true it is, Time has whitened, but whose soul it has not bleached. Men of this age and temperament are amongst the disgraces of our nature, and the example set by their infamous habits of life is not the least of the wrongs with which they outrage society.

As we have stated, education must commence with their youth; moral precepts should be diligently inculcated; immoral words and acts should be carefully eschewed in their presence, (as indeed they should be at all times), but especially so in the presence of young boys. Well and nobly has the Roman satirist expressed himself when he writes:—

> "Nil dictu fœdum, visuque hæc limina tangat
> Intra quæ puer est."

Whilst thus guarding his tender mind from every possible source of contamination, his bodily vigour should be cultivated with equal care: athletic sports, out-of-door amusements, should be encouraged; but, above all, the strictest sense of respect for woman, in nature of her sex, should be inculcated: he should be taught to reverence her as a higher order of being, and one whose dependent virtue looks up to his for support and protection. No rude word to a little sister, no disparaging remark to a female domestic, should be passed over unnoticed and unchecked; in this way will something approaching to the age of chivalry be restored to our more degenerate times,

and the good it worked, at least in this respect, may be best judged by a perusal of the following extract:—

"A potent influence over the morals of the southern people, the higher classes at least, was exercised by the institution of chivalry. It was of the essence of that institution to promote spiritual at the expense of sensual gratification. The chevalier adored his mistress in secret for years, without even venturing to breathe her name. For years he carried a scarf or ribbon in her honour through battle-scenes and dangers of every kind, happy when, after a lustrum spent in sighs and hopes, the charmer condescended to reward his fidelity with a gracious smile. It is evident that sexual intercourse must have been rare among people who set so high a value on the merest compliments and slightest tokens of affection; nor can there be any question but the effect of chivalry was to impart a high tone to the feelings and language of society, and to soften the manners of all who came within its influence."

Even still our work is as yet but half accomplished. Society owes a duty to itself, and should see to it well that she discharge it becomingly. The ill-doer of either sex should be scouted from her precincts; if any difference is to be made, let it be made in favour of the one who but too frequently is more sinned against than sinning; not as it now-a-days is but too often done in favour of the tempter and the destroyer. Why should the male partner in this infamous breach of one of God's holiest ordinances rear his unblushing front in the midst of matrons and virgins, whose virtue, in the person of some one of them, he has violated and disgraced, and the female partner in his guilt be tabooed and expelled? On what principle is he received in society, with the half-muttered murmur—"that dear, shocking creature, Mr. So-and-so," and his wretched victim be doomed to a *solitary* expiation of a crime in which there were *two* actors? Out upon the hollowness of a world that can bring in such a verdict! Shame on the parents and relatives that can sanction it by their presence!

One more prophylactic measure, and we are done. In the case of a man convicted of adultery or seduction, let all mention for the future of recompense by pecuniary damages be ignored. If he be convicted of such crimes, let them be expiated by confinement and hard labour. We are well aware of the fact that many men, both young and old, are prowling about our large cities, like wolves, in search of what they can devour. Let them, once for all, understand that their appetites can be indulged but at the expense of their personal liberty; that their lustful feelings are, in case of conviction, to

be purged by the sweat of their brow, and the waste of their muscular energy; that in no case, under no circumstances, can the penalty be *bought off*, and we vouch for it that the records of prostitution will be relieved of many of its most painful, its most heartless entries.

In conclusion, we feel that we have but very imperfectly discharged the duty we have attempted in the present article. Our only excuse is, that when we commenced, we had no idea of allowing it to reach the extent it has. A work was submitted to our consideration, involving topics on which we feel deeply, and have thought long. Some of these views we have, in a most imperfect manner, we confess, placed before our readers. On a future occasion it may be permitted us to supply our present deficiencies; till then we can only pray our readers by their kind indulgence to make good our short-comings. All must agree as to the importance of the subject. In treating of it we have tried to do so in a manner that cannot summon a blush even to virtue's cheek. It is true, that immorality has been our theme—but to discuss even such a topic it is not necessary to descend to the use of indecent expressions or immoral anecdotes; and, personally, we are not inclined to yield to any in our reverence for and admiration of the sentiment expressed in the lines of one of the greatest of our poets, when he states that—

> "Immodest words admit of no defence,
> For want of decency is want of sense."

The Uræmic Convulsions of Pregnancy, Parturition, and Childbed. By Dr. Carl A. Braun, Professor of Midwifery, Vienna. Translated from the German, with Notes, by J. Matthews Duncan, F. R. C. P. E., &c., &c. Edinburgh: Sutherland & Knox. 8vo, pp. 70.

Dr. Braun's observations upon the convulsions of pregnancy and childbed, contained in his text-book of Midwifery, were considered by Dr. Duncan of such importance, that, two years ago, he translated this portion of the Professor's work for the Edinburgh Medical Journal. This translation we now have in a separate form, together with notes by Dr. Duncan.

Convulsions, as they appear in the practice of the obstetric physician, are symptoms of the gravest import. Perhaps, with the exception of the worst form of unavoidable hemorrhage, no complication is so appalling as that of eclampsia with parturition.

A distinct treatise upon this subject has been much wanted, and we feel indebted to Dr. Duncan for placing within our reach, by means of his excellent translation, this most valuable portion of Professor Braun's work. We shall endeavour to give our readers a short analysis of this volume.

"Few diseases," says Dr. Churchill[a], "have given rise to such different opinions as to the proper mode of treatment, in consequence, probably, of not distinguishing *the different species* of convulsions." Now we have had convulsions variously classified, thus: hysteric, epileptic, and apoplectic. Again: sthenic, or hyperemic; asthenic, or anemic; and hysterical. Classifications like these may distinguish species, and yet afford us but a doubtful clue to their treatment. We must have a classification that shall be founded upon absolute causality before a resolution into species can be any guide to our treatment.

Convulsions heretofore, for the most part, have been treated, it must be said, rather empirically. All that were not supposed to have their origin in hysteria were treated as hyperemic. By truly tracing out the origin of convulsions, we not only constitute a useful classification, but by that classification afford a system of mnemonics for their treatment.

The author considers that *true* puerperal eclampsia consists in uremia, the consequence of Bright's disease. He concedes that the coincidence of albuminuria and eclampsia has been long since demonstrated; and that this state of albuminuria has been found intimately connected with Bright's disease; that the eclampsia depends not on the presence of urea, consequent upon Bright's kidney, being retained in the blood, but that the urea is decomposed into carbonate of ammonia, which latter intoxicates the nervous centres, and its presence is evinced by spasmodic action.

Eclampsia puerperalis Professor Braun defines to be—

"An acute affection of the motor functions of the nervous system (an acute neurosis of motility), characterized by insensibility, tonic and clonic spasms, and occurs *only* as an accessory phenomenon of another disease, generally Bright's disease, in an acute form (diabetes albuminosus, nephritis diffusa sive albuminosus), which, under certain circumstances, spending its toxemic effects on the brain and whole nervous system, produces those fearful accidents;" and that this disease "may manifest itself in women not pregnant, in children, and even in males, under certain circumstances favourable to it."

[a] Diseases of Women, by Dr. Churchill.

The question arises, are there not other causes of convulsions during pregnancy and parturition besides uremia? Certainly, and the author desires that true eclampsia may be distinguished from that arising from either defective purification of the blood, such as defective elimination of carbonic acid and of bile, &c., and also from cerebral or apoplectic eclampsia, originating in meningitis, encephalitis, apoplexia intermeningealis or capillaris cerebri, thrombosis of the longitudinal sinuses, or hyperemia of the brain, spinal cord, and medulla oblongata; also from those induced by irritation of the terminal nerves, which, by a reflex action on the spinal marrow and medulla oblongata, produce so-called hysterical convulsions; and lastly, epileptic fits.

Hence we may presume Dr. Braun to constitute the following as his classification of convulsions:—Uremic or true eclampsia puerperalis; toxemic from other poisons than that of carbonate of ammonia; hyperemic; anemic; hysteric; and epileptic. So far as we are concerned, it makes little matter to which of these belongs the title of *true* "eclampsia puerperalis." They certainly may, each in their turn, come under our observation in connexion with parturition, and thus complicate that process. It remains for us to find out which of these forms it is we have to combat, and act accordingly. Confining himself to the consideration of uremic convulsions, the author argues that Bright's disease and uremic intoxications are the causes, and not the results of eclampsia, as some have imagined. But the question may arise, how is it that albumen may be found in the urine of the parturient woman, indicative of the presence of urea in the blood, consequent upon diseased kidney; and yet there may be no convulsive seizure. Urea may be in the blood, but it does not follow that convulsions should take place; unless the urea be decomposed into carbonate of ammonia, there will be no convulsions.

"If the fermenting material be wanting, then the blood may be for a long time impregnated with urea, without injurious consequences appearing. In this way the fact is accounted for, that in the bodies of persons dead of Bright's disease, the blood may be found saturated with urea, without any uremic phenomena having been observed during life." "The cause," he continues, "of this fermentation is, as yet, not altogether known."

He then proceeds to examine the connexions between true eclampsia and the pains of labour; and he informs us that "by exciting pains, and increasing their strength, fits cannot be produced at will, nor even aggravated." We have made

the observation, that under a high degree of reflex sensibility, convulsions cannot be induced at will at definite periods by violent irritation of the uterus; and that by the energetic use of the caoutchouc bladder plug, very strong pains may, indeed, be produced, but no increased intensity, and no more frequent return of the eclamptic fits; and that during colpeurysis[a] the convulsions themselves sometimes altogether cease, and the birth of the child takes place rapidly. This is contrary to the general opinion in this country; however, the colpeurynter is an *experimentum crucis.*

The question as to the influence of eclampsia on the life of the fœtus is one of considerable interest. That the mortality of children in these cases is very great, is the experience of every practitioner. How, then, is this accounted for? Some authors, amongst whom was Kiwisch, referred the child's death chiefly to obstructions of the circulation through the placental sinus, but ignored the idea that the fœtus was itself destroyed by eclampsia. From this creed the author dissents for several reasons, such as—

"Convulsive fits, originating in habitual epilepsy, and appearing repeatedly on the same day, never exercise any injurious influence on the life of the fœtus, when albuminuria is altogether absent;" whereas, "after one or two eclamptic fits, it is sometimes found that the fœtal motions have diminished in liveliness, and the fœtal heart-sounds have ceased." "If the mother dies during pregnancy, under uremic symptoms, it is almost always a dead child that is brought to light by the abdominal section." "If after numerous uremic convulsive fits, the child is born alive, a large quantity of urea is found in the blood taken from the umbilical cord; but if it is born dead, we can immediately after the birth demonstrate the presence of carbonate of ammonia in the fœtal blood," &c.

But Dr. Braun does not altogether ignore other injurious influences, such as interruptions of the placental circulation by violent pains in certain cases, pressure on the cord, &c. He does not mention that he has observed, with Simpson, Bright's disease of the kidneys in children born of eclamptic mothers.

The etiology and pathology of uremic eclampsia, and the intimate connexion between eclampsia and uremia, are fully entered into, and the volume terminates with a chapter on the differential diagnosis of uremic eclampsia, and other affections of the motor system of nerves, its prognosis and treatment.

[a] A name given by the Professor to his operation of distending the vagina by means of water forcibly injected into a caoutchouc bag for inducing premature labour. During the operation the bag is promoted, and assumes the title of "colpeurynter."

To distinguish between the various forms of convulsions is of the greatest importance, and this portion of the volume is well worthy of perusal.

With respect to the treatment of uremic convulsions, as laid down by Professor Braun, there are one or two points to which we cannot avoid directing attention.

Inasmuch as the convulsions arise from blood-poisoning, occasioned by the decomposition of urea into carbonate of ammonia, he is in the habit of prescribing—according to Frerichs—benzoic, tartaric, or citric acid, to neutralize the carbonate of ammonia, while, to obviate congestion of the head, he keeps the bowels open by means of jalap, or aloetic purgatives, and vinegar enemata. When convulsions occur during labour, he says, "the chief object to be attained is to diminish as much as possible the reflex excitability, to weaken the paroxysms, in order to diminish the dangers, and to gain time for entering upon rational treatment." To accomplish this, the author employs chloroformization. This state—

"Is to be induced instantly when indications of an impending paroxysm show themselves." "The narcotism is to be kept up until the premonitory symptoms disappear, and quiet sleep follows, a result," he says, "generally attained in one minute." "But if it be not possible to cut short the paroxysm, then the chloroform inhalation is not to be continued during the convulsive attacks and the comatose condition."

Although we can go so far as to corroborate Professor Braun's assertion that chloroform is sometimes certainly of use in puerperal convulsions, so far as it moderates the attacks and gives time, yet we cannot give to it the unqualified praise that we find accorded to it for the treatment of this dangerous malady, in the volume before us. However, Dr. Braun's experience appears to be certainly favourable to anæsthesia, for he informs us, that "in sixteen cases of eclampsia, occurring in succession," which he "treated with chloroform and acids, complete recovery always took place." Ice and cold aspersion are recommended, or the cold douche on the head, for the purpose of moderating secondary congestion. With regard to blood-letting, the author is of opinion that "a general depletion of blood in uremic eclampsia has very seldom any valuable effect on symptoms, and generally produces irreparable injury." Still, there are exceptional cases, for even, according to Braun, "our moderate general blood-letting is not injurious in the case of strong, full-blooded women, when there is violent pulsation of the carotids, and the face continues dark red a considerable time after the

fit." But the routine of using phlebotomy as a panacea against eclampsia, the author considers as a proceeding unjustified by the present state of theoretical knowledge in regard to this disease.

We have given a hasty sketch of this volume: in our opinion it is one of considerable interest, and we strongly recommend it to the profession.

We here take the opportunity of correcting an error of omission which occurred in the review of M. Giraud-Teulon's work on "Animal Mechanics," in our last Number, and to which our attention has been directed by Dr. Matthews Duncan. It appears that the views regarding the mechanical function of the os sacrum, as advanced in that work, had been long previously entertained by Dr. Duncan, who published some papers on the subject in the Edinburgh Medical Journal, in the year 1855, wherein he distinctly assigned to that bone the mechanical office of a reversed wedge. The first essay of M. Giraud-Teulon upon this subject appeared in the Gazette Médicale de Paris, in November, 1856, and about the same time Dr. Imbert, of Louvain, presented to the Royal Academy of Belgium a paper, in which similar views were put forward. According, therefore, to the criterion of publicity, the priority of the discovery to which each of the three has been led is doubtless due to Dr. Matthews Duncan.

Pathology and Social Science: the Irritable Bladder, its Causes and Curative Treatment. By Frederick James Gant, Surgeon and Pathological Anatomist to the Royal Free Hospital, &c. London: Churchill. 1859. 12mo, pp. 136.

Since first we dipped a pen into reviewer's ink, no work has come before us, which has given us greater cause for perplexity as to how we should treat it, than that whose title heads the present remarks. Bearing as its author the name of a gentleman occupying the position that Mr. Gant apparently does amongst our metropolitan brethren, filling the highly responsible position of Surgeon to a London Hospital, and even selected to hold therein an honourable and distinctive position, we cannot reconcile ourselves to class the present production amongst the trumpery catch-pennies issued from the press by the unblushing members of our profession, who, seeking to degrade the science of medicine into the lowest ranks of *trade*, rush into print on some special subject, and,

thereby gaining a bubble reputation, emerge from well-merited obscurity into an ephemeral notoriety, and all for the sake of the (to use a trade expression) *returns* thereby procurable. No; we cannot reconcile ourselves to adopting this view of Mr. Gant's labours; and yet in what other light can they be regarded?

As a true exposition of the state of our knowledge of the pathology, symptoms, and treatment of irritable bladder, for the sake of the reputation of the British school of medicine, we dare not accept it; far less can it be looked on as a work even in the slightest degree advancing our present knowledge of these subjects. Nor can we believe that Mr. Gant himself would wish our continental or transatlantic brethren to look upon his present work as a full record of the amount of information possessed by British surgeons on these points, or even as indicating the extent of his own acquaintance with the disease which he has discussed in its pages. To what conclusion, then, are we to arrive? As we have already intimated, this question is one that perplexes us to answer.

The term "social science" is one which has now-a-days become so familiar, that the adoption of it, even though coupled with the word "pathology," as the heading of his title-page, savours strongly of a hankering after the flesh-pots of empiricism, and in a gentleman occupying Mr. Gant's position cannot be too strongly deprecated; however, further to pursue this theme is so distasteful to our better feelings, that we shall allude to it no further, but proceed with our analysis of the manner in which he has discharged his self-imposed task.

Assuming, then, that Mr. Gant *has* produced his work for the benefit of his professional brethren, we may be permitted to ask him does he hold our mental acquirements in such low estimation as to think it necessary to enlighten us on the meaning of the term "hypertrophy," as he does in the 108th page of his work, where he makes use of the following mode of expression: "Nor can hypertrophy (overgrowth) of the bladder be reduced," &c.? or does he think that, in a work intended to be of scientific character, he is justified, in describing the various urinary deposits, to term them, "white sand, red sand"? or does he, in all sobriety and truth, mean to claim for himself (as is to be inferred from the italicised capital *I* employed) the credit of first pointing out that hysteria is a misnomer, and that in the disease recognised by that name the uterus is not necessarily primarily engaged? or does he feed himself up with the flattering delusion that he is the first and only person who employs saline aperients in the treatment of the acute stage of

gonorrhœa? or does he imagine that he has done much for the cause of humanity suffering from hemorrhoids by the following remarks, which we must be allowed to introduce for the benefit of benighted surgeons?—

"Hæmorrhoids may be accompanied by much pain about the neck of the bladder, with a frequent desire to pass water. I have almost invariably found the following laxative of great service in this distressing condition:—

℞ Potassæ bitartrates (*sic*)
Pulveris sulphuris āā equales partes;
Mellis, quantum sufficit ut fiat electuarium.

"One teaspoonful of this electuary may be taken every night, if necessary; and its beneficial effect aided by the topical application of the Goulard lotion, or by the use of the unguentum Gallæ."

This, as being the only prescription introduced into his brochure, deserves a special mark of recognition at our hands; but we feel assured that any medical student could supply Mr. Gant with a better formulary, extracted from the Pharmacopœias, for *sulphur electuary*. On reading the flourish of trumpets with which the remedy is announced, we must confess that our expectations were exalted in the hopes of getting some valuable suggestions from the Surgeon and Pathologist of the Royal Free Hospital. Alas, however, for the confiding nature of our Hibernian disposition!

Again, we should wish to ask Mr. Gant, is British surgery in that state of outer darkness that it is requisite for him to impress on us the necessity of opening an abscess about the rectum freely and at an early period, or to enlighten us on the difficulties attending its "pointing," and the dangers accruing from a neglect of the proper treatment? The ladies of England may be under a deep debt of obligation to him for his suggestions about the proper treatment of their flowing auburn locks on emerging from the deep (and, even here, we suspect that he has been anticipated by our wild Irish girls); but, on the part of British surgery we assert, that every fact stated by him, in connexion with vesical irritation, is familiar to students of even two years' standing. We appeal from the *author* to the *Surgeon* of the Royal Free Hospital to point out one source of irritable bladder mentioned in his work that is not to be found recorded in any surgical text-book of character; and whilst acknowledging in certain conditions of life the cogency of the remark, "il faut vivre," for ourselves we declare that it shall never be allowed as a plea in abatement for the production of a book without a nobler mission.

A System of Dental Surgery. By JOHN TOMES, F. R. S., &c. London: Churchill. 1859. Fcap. 8vo, pp. 599.

OUR profession during the last half century has exhibited a singular tendency to separate into its component elements, with a view to the more perfect development of its great mission.

It would seem as if the unquiet spirit of revolution which has so disturbed the political, had likewise infected the medical world;—that as in the one case oppressed nations have determinedly broken loose the fetters with which they had permitted *effete* despotisms to bind them; so, in the other, the members of our great faculty, content in earlier times to work all together under the standard of Galen or Hippocrates, have, in a similar spirit of discontent, broken through all restraint, and established separate little realms, in which each rules with undisputed sway, whilst acknowledging a sort of federal connexion with the old commonwealth. Thus have we "pure" physicians, "pure" surgeons, "pure" accoucheurs; whilst numerous petty potentates, content to rule over a single organ, or mayhap over some grave disease, are year by year being born into a distinct and separate existence. Of these it will be sufficient to mention "ophthalmists" and "aurists," "cancer" and "consumption" doctors, "dermatologists," those who control the realm of insanity, "syphylographers," &c.

This disruption of and outgrowth from the parent stock has been most beneficial in its results upon the progress of our scientific knowledge. It has given freer scope for the exercise of the general intelligence, and, by enlarging to a vast extent the basis of the profession, has served to establish it upon a more solid and endurable foundation.

Dental surgery, which may be said to constitute one of these outgrowths, illustrates in a striking degree the advantages of this change. Until a comparatively recent period, its professors, at least in this country and Great Britain, had neglected the extended scientific culture necessary to elevate it to a level with our profession. Without chartered dignity or privileges, they had been content, under the shadow of the favour and patronage of the public, to pursue it, with some distinguished exceptions, rather as a handicraft than as a professional study.

John Hunter led the way, in his able Treatise on the Teeth, to a scientific investigation of the pathology of the dental apparatus; and the great Dupuytren, at the same period, in stating his belief that a large per-centage of the cases of dyspepsia met with in practice had their origin in a disordered condition of these organs, did much to stimulate inquiry.

Our American brethren at an early period entered the great field thus indicated to them, and deserve credit for their efforts to found dental colleges, and otherwise advance the dignity of the profession. Nor were the British dentists backward in the good work. They have long since supplied us with a high standard of periodic literature; and the investigations of Blake, Bell, Tomes, Nasmyth, &c., have thrown much light on our knowledge of dental pathology. We are happy to see that within the last few years, too, they have joined in a united effort to establish themselves as a corporate body; and we doubt not their new College will shortly prove itself worthy to rank with the distinguished one with which it has been affiliated.

Were we disposed to entertain doubts on the subject, the work before us would tend in no slight degree to dissipate them. Emanating from one whose name will be identified as having taken a leading part in the recent organization of his profession, it has the advantage of being all that could be desired in a manual of the art; ably filling a void long felt in general surgical literature, and well calculated to uphold dental surgery in the high position to which it has attained as a scientific branch of the healing art.

The first and largest portion of the work is devoted to an exposition of all that is understood by the term "teething,"—its anatomy, physiology, and pathology. Perhaps no subject in the whole range of medicine is of more importance, owing to the suffering it inflicts, and the great mortality attending it; and none, we venture to say, has had less attention paid to it. From a hasty perusal, we cannot perceive that the author has attempted to resolve our doubts on many leading points connected with this singular process. He seems to have fairly exhausted our knowledge of the subject, whilst guarding himself from giving any opinion on the immediate cause of the various maladies incidental to it, or seeking to explain their mutual pathological relations; about all which, indeed, he candidly admits, our knowledge is as yet but extremely limited.

We quite agree with him in his caution of the practice, extremely common in all cases of illness occurring during the period of the first dentition, of having recourse to the gum-lancet. Whilst we admit that in many cases this simple operation will be followed by the desired relief, it is no less certain that—

"The indiscriminate adoption of this treatment in all cases when the gums are turgid and inflamed will occasionally lead to mischievous results. In children who are enfeebled, either from disease or residence in a bad atmosphere, ulceration of the wounded parts may follow as a consequence of the operation."

A large portion of the work, as would be anticipated, will interest especially those engaged in the mechanical department of the art. The surgical reader will, however, find everywhere scattered throughout matter to interest and instruct him. In the chapters devoted to irregularities in the growth and position of the teeth, which is treated of at great length, we find the following remarks, which we commend to the attentive perusal of our readers :—

"There is, perhaps, no point in the whole field of dental surgery that yields a finer harvest to the charlatan than that afforded by the treatment of irregular teeth. The patients are necessarily young people who have not passed from the care of their parents. There is a great desire on the part of the latter that the teeth should be good-looking, or at least not ill-looking; at the same time, there is great unwillingness, both with the patient and the parent, that the treatment should be extended over a long period of time. The presence in the mouth of a mechanical apparatus pressing upon the teeth interferes with the comfort of the young patient, and the frequent attendance at the house of the dentist encroaches upon the hours allotted for study. Both circumstances render prolonged treatment irksome; impatience is shown, the instructions are neglected, and, as a natural consequence, the results fall far short of those which might have been obtained had the treatment been consistent. I believe it is in accordance with the experience of those who have devoted their attention to the treatment of irregularities, that where the front teeth have been brought in by mechanical means, and where mechanical means are required to hold them in place until they become permanently fixed, the treatment must be continued for twelve months. It may not be necessary that the apparatus should be constantly worn for the whole period, but it cannot be wholly thrown aside. Towards the latter part of the time it may be worn occasionally only; but even after the lapse of twelve months, should the teeth show any indication of movement from the desired position, mechanical restraint must be resumed."

And again he tells us :—

"It is very necessary that this part of dental surgery should receive far more consideration in an anatomical and physiological point of view than it has hitherto done. In the absence of precise knowledge upon the subject, there is room for great disparity of opinion as regards treatment, leaving a wide and very productive field for the cultivation of the charlatan, who sees in every case of irregular disposition of the teeth an opportunity for mechanical interference, in some cases securing to himself a large fee for doing by means of mechanism that which Nature would have effected, had the opportunity been allowed; and in other cases submitting the patient to a long course of treatment which entails no useful result."

We may here add, that the cases adduced by the author in proof of the efficacy of well-conducted pressure in remedying deformities of this kind are exceedingly instructive as showing to what a great extent the regulation of the teeth is under our control in early life.

The chapter devoted to the pathology and treatment of caries of these organs contains many useful hints to the general practitioner. Our eye, for example, lights upon the following observations, interesting in connexion with the very general practice of stuffing decayed teeth with wool or cotton steeped in anodyne or astringent liquids, with the view of giving relief:—

"In examining the circumstances under which the decomposition of the dentine takes place, and under which it is resisted, apart from the influence of vitality, any one must be struck with the power that is exerted by the mere form of the surface involved. Supposing the disease to be situated in a deep fissure, or upon the side of a tooth, against which another tooth is placed, the decomposition will go on with more or less rapidity, the rate being varied in accordance with the condition of the oral fluids. But if the cavity be superficial, and so placed that it is subject to friction during mastication, the progress is usually relatively slow; and if the low walls of such a cavity be removed, the part will become polished by the act of mastication, and by the motions of the tongue, and decomposition will be completely arrested, quite independently of any power of resistance exercised by vital action. Again, let a tooth be placed under circumstances the opposite of the preceding. For example: take a bicuspid of the upper jaw, the distal surface of which is decayed, and remove the softened dentine; then let dry cotton wool be forced between the defective tooth and its neighbour, and renewed only once in three or four days; at the end of a fortnight or three weeks it will be found that the surface of the cavity which was left hard and dense after the first operation, has become soft, and that the softening extends to a considerable depth. Had the cotton, prior to its introduction between the teeth, been dipped into a solution of any resinous gum, such as mastic, the surface of the cavity would have remained unaltered, owing to the exclusion of moisture. But where wool only is used, the secretions of the mouth are not only not excluded, but are held in constant apposition with the exposed dentine by the saturated wool."

The author treats lightly the employment of electricity in dentistry, either for the purpose of destroying the dental pulp by means of the platinum wire brought to a white heat,—for which purpose he prefers to use arsenic,—or with the view of preventing by an electric current the pain felt in extraction. Our experience of both these "Yankee notions" would lead us

to differ somewhat from the author, especially with regard to the platinum wire, which we frequently employ with the best results. With respect to the anæsthetic influence of the electric current, about which we have heard and read so much of late, we confess our experience would induce us to recommend further investigation. Undoubtedly it has seemed, in our hands, in many cases to have produced a perfect insensibility; but we are bound to say, it has quite as frequently failed when employed in other cases, under the like circumstances.

We regret that we cannot at present dilate at greater length upon the merits of a work which we highly recommend to the profession. To the library of country practitioners especially it will be an invaluable addition. Liable as they are to be more frequently appealed to in cases of dental pathology than their brethren in the large cities, where specialists abound, they will do well to fortify themselves by acquiring the extended acquaintance with the subject this work will afford them.

We would especially remind them, in the words of the author, that—

"No portion or organ of the body, either in health or disease, can be independently considered. Whether an inflamed eye or a diseased tooth form the subject of inquiry, it must be borne in mind that neither can exist but as one of many parts which collectively form the body; that the healthy condition of an organ is due to a corresponding state of the whole organism, and more especially to a sound condition of the organs in its immediate vicinity, or with which it is closely associated; and that a state of disease may be consequent upon, or even a symptom of, a disordered state of a neighbouring part of the body. On the other hand, a diseased condition, originating in an eye or a tooth, may induce sympathetic affections even in remote organs, and in doing so may seriously disturb the general health. It is necessary that the mutual dependence of the various organs upon each other should be fully acknowledged by those who restrict themselves to special branches of practice, and who naturally feel a strong tendency to isolate and place in an independent position, and to give an exaggerated importance, to the diseases of the one organ or set of organs to which their attention is more especially directed."

Memoirs on Diphtheria, from the Writings of Bretonneau, Guersant, Trousseau, Bouchut, Empis, and Daviot. Selected and translated by Robert Hunter Semple, M.D., with a Biographical Appendix by John Chitto, Librarian to the Royal College of Surgeons. London: The New Sydenham Society, 1859. pp. 407.

Amongst the many remarkable things to be noted in the annals of our profession, we hold it to be not the least remarkable circumstance that, in a science of observation, as, more or less, medicine undoubtedly is, a disease will arise, spread, and exist for ages, die out, and almost be forgotten, reappear, be described as a new disease, its etiology be misunderstood, its pathology incorrectly described, its treatment, as a natural sequence, be established on uncertain data,—until the appearance of a master mind, who, studying the symptoms of to-day by the light of the records of past ages, recognises the identity of the two affections; by laborious toil in the dead-room establishes on correct data its pathology, and, availing himself of the experience of the past, with the increased light shed on medicine by the advanced position occupied by science at the present, directs its treatment on rational principles, and, as a consequence, is by many looked on as the original discoverer of a new disease, though such be not the case. His only claim is to have described that which has been known for centuries, but to have done so more in accordance with the position that, at the present moment, pathology should occupy amongst scientific physicians. Such is the history of diphtherite, and such is the relation held to it by the distinguished physician of Tours.

For the present collection of papers on this subject we are indebted to a new Society that has started up amongst us,—"The New Sydenham Society"—a Society that, in our opinion, seems to have adopted for its motto, *de facto*, if not *de jure*, Deeds not Words, this being the third volume already this year presented to its members; the first volume, Diday on Infantile Syphilis, has been lying on our table for some time, and a review of it should have appeared in the current Number of this Journal, but, considering its subject to be of so important a nature, and that the intrinsic merits of the book itself demand more space than we can spare to it at present, we have postponed its appearance until our November issue, when we promise our readers a full analysis of one of the ablest works that has yet appeared on this most intricate subject. In the mean time, we can only wish success to a society that has inaugurated its career in so auspicious a manner.

Amongst the series of papers now before us, far the most prominent position is allotted to M. Bretonneau's memoirs on Diphtheria—in fact these, five in number, constitute fully one half of the volume; and, taking into consideration the advanced position in reference to this disease occupied by this learned and zealous physician for considerably more than a quarter of a century, we consider that the post of honour has been justly conceded to his deservedly acknowledged supremacy. To our minds a great charm is thrown around this gentleman's writings by the mixture of earnestness, frankness, and simplicity, by which they are characterized; thoroughly imbued with the importance of the views that he advocates, he never for a moment seems to be ashamed to put on record the errors he unintentionally fell into in his search after truth. An air of candour seems to pervade all his writings on the subject, and he appears to have written with but one sole motive in view, the establishment of correct views about this disease, based on the only sure foundation—sound pathological investigation—and on these to raise up a superstructure of rational, and, because rational, successful treatment. As an example of these statements, we shall extract the very first case he has put on record:—

"Case 1.—A child, five years old, healthy, and of good constition. Coryza, rather severe pain of the ear, which was relieved after the appearance of a serous discharge through the auditory canal. For two days only there had been slight pain in the throat; deglutition was so little affected that the child supped in the evening with its parents, and with its accustomed appetite. The third day the throat appeared to be obstructed, and on examination of the back of the mouth, at eleven o'clock, A.M., large grey spots were seen covering the tonsils, the bases of which were red and swollen. Eight leeches were applied to the sides of the neck, and produced an abundant flow of blood; and kermes mineral was given in emetic and repeated doses. There was a hoarse cough, with alteration of the sound of the voice; in the evening there was aphonia, extreme fetor of the breath, a blackish-grey tint of the eschars which extended over the whole surface of the pharynx; frequent and small pulse; dyspnœa, lividity, and sinking, which terminated in a peaceful death during the early part of the night. It appeared to me very evident that death was caused by gangrene of the back of the mouth; but I asked and obtained permission to make inquiries into the extent and true seat of disease, which had had so rapid and fatal a termination.

"*Necropsy.—External appearance.* Body stout; lividity; tumefaction of the sides of the neck. *Internal appearances, observed eight hours after death.*—The velum palati was of a blackish-grey

tint, as far as the height of the palatine arch; the putrid decomposition of the surface of the tonsils appeared still more advanced; the eschars extended from the guttural opening of the nasal fossæ as far as the commencement of the œsophagus; they penetrated into the glottis, where they assumed a dull-white tint. Their margin was marked by a bright-red line. The mucous membrane of the trachea exhibited no trace of inflammation; a small quantity of mucus was accumulated near the bifurcation of the bronchi. This gangrenous alteration, which had extended with so much rapidity, had gained so little in depth, that the velum palati, divided from before backwards, presented a vermillion section between two grey lines, which were quite superficial. The fetid odour exhaled by the patient had ceased to be perceptible after death.

"It was impossible to make a more imperfect investigation. To what a degree may prejudice blind the judgment! The prepossession in favour of the existence of a gangrenous affection prevailed over evidence. Although no excuse can justify the want of attention in so severe a case, where everything demanded the most accurate investigation, some circumstances may at least explain the hurried nature of this autopsy, which was made in the middle of the night, in a confined place, and under the eyes of parents, whose sorrow inspired me with the fear that I had already carried my zeal for science too far.

"Doubt was the first result of this case. Indeed, how could gangrene be limited to such slender surfaces, and deviate in this respect from its habitual character? A disposition which was so peculiar to this epidemic affection required a new and especially a more severe investigation. There was reason to fear that the occasion would not be long wanting, for it was observed that the number of those who were dying of Gangrenous Angina was daily increasing. Children were particularly attacked by it, and at this age the disease appeared to be transmitted by contagion."

Another charm about M. Bretonneau's writings is the graphic manner in which his cases are described. The reader is irresistibly interested in their success or failure; his sympathies are all enlisted on behalf of the poor sufferers, and he alternately triumphs or mourns as the result proves fortunate or otherwise. The first case in which M. Bretonneau successfully employed tracheotomy, that of Mademoiselle L. de Puységur, may be quoted in illustration of this statement; and we should not envy the feelings of that man who would not participate in the feelings that must have throbbed in M. Bretonneau's breast on restoring to the father, already bereaved of three children by this insidious disease, the fourth subject of it, after a prolonged struggle with death, and only saved by the skill, judgment, and dexterity of her medical attendant.

The symptoms of diphtherite are by this time too well

known to our readers, and too ably described in the numerous memoirs that, both in this country and abroad, have appeared on the subject, to render it necessary for us to reproduce them here in detail; however, we should not be doing justice to our subject did we not allude to a sign laid down by M. Bretonneau in his fifth memoir, dated 1855, as pathognomonic of Nasal Diphtheria; we shall reproduce here his own words:—

"Under these circumstances, a minute and attentive vigilance is imposed upon us. When the Egyptian disease prevails and is propagated with the intermittent march which characterizes its irregular outbreaks, and when, from one year to another, it has raged so extensively as it has been seen to do in Paris within the last six years, it is incumbent on us not to wait for visible symptoms; but at the least sign of snuffling, at the slightest indication of coryza, to *feel* and not to *look* beyond the angle of the lower jaw, below the lobe of the ear, and thence down the sides of the neck. If in this region we should find any swollen lymphatic glands, our attention should be redoubled, for if we feel a glandular swelling, it is more than probable to be a consequence of the absorption of the Egyptian virus.

"Do not be satisfied with this examination, for it is necessary that the diagnosis should leave no doubt; examine, therefore, the upper lip below the nostrils; in the most simple coryza the skin is reddened *equally* under each nostril, while in the case of the Egyptian disease it is *only* on the side of the glandular swelling. If the swelling exists on both sides, it is unequal; on the side where the swelling is least, the redness of the lip of the same side is least. From the period of this discovery, we are certain that there is a special affection, in fact the Egyptian disease.

"Then let me advise you to act instead of talking, and with a glass syringe, the padded extremity of which ought to be yielding and incapable of causing pain, inject into the nostrils alternately a solution of nitrate of silver, and although the injection may flow back through the nostril which has not been injected, it will be well that the latter should also receive an injection of suitable strength, if, on the corresponding side, there is the least swelling of the cervical glands."

M. Guersant's memoir is devoted principally to that form of diphtheria represented by croup. He takes very proper objection to the confounding true with false croup, a mistake, we fear, but too prevalent even at the present day; the former, the pseudo-membranous pharyngo-laryngitis, a most formidable disease, characterized by the formation of the diphtheritic membrane; the latter, the laryngismus stridulus, never presenting this complication. From his statistics we are entitled to augur

favourably for the success of the operation of tracheotomy in this disease, he stating that—

"Out of one hundred and seventy-one cases of *post-mortem* examinations in Croup, one hundred and fifty exhibited false membranes in the air-passages, and there were seventy-eight in which these false membranes were confined to the trachea, and only forty in which they penetrated to the bronchi. This result is very favourable, as will be perceived, to the success of tracheotomy."

But it is to the memoirs of MM. Trousseau and Bouchut that we are principally to look for important details respecting this operation. The advocates for tracheotomy in croup will derive some additional arguments to strengthen their position from the summary of M. Bouchut:—

"Although the success of tracheotomy is not very striking, yet the results are such as ought to encourage its adoption by a physician placed in charge of an infant half asphyxiated by Croup. On the one hand, M. Bretonneau, in twenty operations, saved six children; out of one hundred and sixty, I have saved forty-five. M. Leclerc of Tours, who has adopted the same treatment, reckons one favourable case in two operations. M. Velpeau has cured two children in ten. M. Pétel of Cateau Cambresis, who has followed the same system, has performed successfully three operations out of six which were operated upon. Thus out of one hundred and ninety-eight cases of tracheotomy we reckon fifty-seven cases of success; that is to say, rather more than a fourth."

The principal line of treatment advocated throughout all the memoirs is cauterization, performed either with strong hydrochloric acid (as urged by M. Bretonneau in his earlier memoirs), or with nitrate of silver. Emetics, mercury, and, when symptoms of asphyxia seem *imminent*, but previous to their development to any great extent, the operation of tracheotomy. Depletion, by the abstraction of blood, objected to by both MM. Trousseau and Bretonneau as being worse than useless, is admitted in exceptional cases by M. Bouchut; and when locally performed by the means of leeches applied in relays, as the urgency of the symptoms demands, is spoken highly of by M. Daviot. M. Bouchut, on the contrary, prefers general blood-letting to leeches, stating that, in children, the operation of venesection is more easily performed than the application of leeches—a statement in which we are not inclined to concur. He also alludes to the difficulty of stopping hemorrage from leech-bites in the neighbourhood of the neck—a difficulty which, we think, has been much overrated. It is true that, in the neighbourhood of the trachea, you have no *point d'appui*

on which to make pressure, but we always have it in our power to pinch up the leech-bite in a fold of the loose integument, and make pressure on it between our fingers; or, if a more protracted compression become necessary, we can easily extemporize a most effectual instrument, by employing a pair of small spring forceps, to be found in every surgeon's case, to open which it is necessary to press them. Envelope their extremities in a little pad of lint, to prevent their injuring the soft structures in this neighbourhood; press the blades; the extremities divaricate; grasp the bleeding leech-bite with them, and allow them again to approximate by simply removing the pressure, and, from practical experience, we can promise our readers that they shall have no more trouble from the leech-bite. Since we have commenced employing this plan we never have had recourse to nitrate of silver, ligature, needle, or any other manœuvre recommended for the arrest of hemorrhage from this cause.

All forms of moist applications, in the shape of poultices, fomentations, &c., are deprecated as being worse than useless; purgatives also are not in favour; but blisters are especially indicated as being a fertile source of mischief, the blistered surface invariably developing pellicular inflammation, in other words, cutaneous diphtheria,—a subject, whether occurring in this manner or as an idiopathic affection, is always to be looked on as most serious, and to which full consideration has been given in more than one of these memoirs.

It remains now for us but to express our opinion as to the manner in which Dr. Semple has discharged the duty of selecting and translating these memoirs. Whilst admitting that those he has selected are of great interest and importance, we think that, on the principle of "audi alteram partem," he would have better consulted the interests of his readers, and at the same time rendered fuller justice to all parties, had he incorporated with the present memoirs some of those by equally distinguished authorities, in which a different line of treatment from that suggested in the present volume has been advocated. We would instance Lemercier, an advocate for active bleeding; Baron, the suggester of the alkaline treatment; Gigot, also a supporter of the alkaline plan of treatment, and an opponent of the use of caustics; Stiles, Heslop, and Haughton, supporters of the plan of treatment by muriated tincture of iron; Hutchinson and others, suggesters of the employment of chlorate of potash, &c., &c. As to the manner in which he has translated his authors into English, it has been done in such a manner as even to entitle him to the unqualified thanks of the writers

themselves, presuming that their knowledge of the English language qualified them to be judges. We never have met with a translation so faithful which has so little the appearance of being one.

The work concludes with a most admirable bibliographical account of the disease, from the date of Bretonneau's first memoir on the subject up to the present year,—an account that bears equal testimony to the extent of his information as to the immense amount of industry and research expended on its preparation by its author, Mr. Chitto.

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1. *Om Puerperalfebers Diagnose og Behandling.* Ved Dr. F. C. Faye, Professor i Medicin ved Norges Universitet, Overlæge ved Fodselsstiftelsen og Bornehospitalet i Christiania.

   On the Diagnosis and Treatment of Puerperal Fever. By Dr. F. C. Faye, Professor of Medicine in the University of Norway, Principal Physician to the Lying-in Institution, and the Children's Hospital in Christiania. Reprinted from the Norsk Magazin. 8vo, pp. 126. 1859.

2. *Partus Prœmaturus—Embryotomie.* Ved Dr. F. C. Faye, &c. &c.

   Premature Delivery—Embryotomy. By Professor Faye. Reprint. 8vo, pp. 8. 1859.

3. *Discussioner om Medicinalstyrelsen i det medicinske Selskab i Christiania i October, November, og December*, 1857.

   Discussions respecting State Medicine held in the Medical Society in Christiania in October, November, and December, 1857. Reprint. 8vo, pp. 77, with Appendix, pp. 20. 1858.

4. *Forelöbig Beretning om et nyt Middel til Fostrets Mutilation.* Af Cand. Med. Valentin Heyerdahl.

   Preliminary Account of a new Instrument for Embryotomy. By Valentine Heyerdahl, Cand. Med. Reprint. 8vo, pp. 12. 1854.

5. *Om Chloroform, og dens Brug ved Fodselshjœlpen.* Af Val. Heyerdahl, Cand. Med.

   On Chloroform, and its Use in Midwifery. By Valentine Heyerdahl, Cand. Med. Reprint, 1859. 8vo, pp. 64.

The present contribution of the learned Professor of Medicine in the University of Norway to the diagnosis and treatment

of puerperal fever was elicited by a discussion on that subject which took place, chiefly in his absence, at meetings of the Norwegian Medical Society. After some preliminary observations, the author describes the condition of the Christiania Lying-in Hospital. This building, which was erected at the cost of the State, had been for about eight years used as a general hospital, when it was in 1837 converted into an exclusively obstetrical institution. Many circumstances combined at that time to render it unfitted for such a purpose. In a small out-building were eight privies for the entire of the Royal Hospital, so that the soil gradually became saturated with urinous and excrementitious fluid.

The cellars of the main building were used as dead-house, residence of messenger, and store for various articles,—many of which latter were spoiled by damp. The drainage was imperfect; and accordingly, on several occasions, a large collection of water took place. In consequence of the space occupied by the stairs and a large corridor, there were on the ground floor only two wards, with five beds in each, and a small lying-in room between them. The construction of these rooms was such as to render thorough ventilation impossible. Immediately adjoining the lying-in room, and approached only through the latter, was a dark, ill-ventilated closet, where worn-out mattresses and those not in present use were stored. The yard was and still is enclosed by a circular wall and buildings. In one end was a badly constructed sink, where various fluids, but none excrementitious, were emptied. In the second story sanitary arrangements were so far good that a corridor ran between the wards, and admitted a thorough draught of air, though ventilators were not employed. Under such unfavourable circumstances, the use of the hospital as a lying-in institution commenced in the spring of 1837. In 1839 the sickness and mortality were tolerably great; and in 1842 it was necessary to remove to the empty apartments in the Royal Hospital, as the mortality from epidemic and endemic influences was so considerable that even among the patients in the second story 5 in 47 died, being in the proportion of 1 to 9·4.

After the lapse of six months, patients were once more admitted into the lying-in institution; but in 1845 it was again thought right to remove to the vacant wards in the Royal Hospital, where the prevailing type of disease might have less influence, and where the sick might be successfully treated under Hr. Steffens, then appointed Physician-in-chief. On the latter office Professor Faye entered in 1846; and, at his suggestion, and under his direction, efforts were now made, at the cost of

the Storthing, to render the institution what it should be, especially as it was to serve as a school for physicians and midwives. The hospital was enlarged by the addition of new wards; ventilators were introduced into the old; room was made on the loft and in the yard for the stores; stoves for drying and disinfecting were introduced into the cellars, and the kitchen was transferred to the latter. The second story was enlarged; the privies were removed from the out-house, the foundation of which was dug out to a considerable depth, and new apartments were arranged in it for the school of midwives and for parturient women. Before these arrangements were complete in 1849, the practice during the three preceding years had been favourable, although the cases of sickness of a prevailing inflammatory type were many, and particularly in 1847 were very violent, under the form of peritonitis. Opiate treatment internally, in combination with other and particularly external means, then appeared so efficacious, that the author began to think this plan capable of general application.

At the close of 1849 the Institution was again in action, and the wards now received a smaller number of beds. Nevertheless, it was the lot of this hospital to undergo, in 1850, an epidemic of puerperal fever, which certainly also attacked with tolerable severity parturient women through the city, but was so particularly violent in the Institution as to lead to the inference that special endemic influences must still be in operation there. The opiate treatment was now inefficacious, and the author subsequently obtained better results from the immediate employment of calomel and quina, with brisk purgation. The hospital was now again accurately examined, and it was found that the air from the kitchen in the cellar, passed directly into the school of the Institution, and it was thought that this impure air formed a favourable medium for the miasmata. The kitchen was now again moved up stairs, all constant communication with the cellar was cut off, and a better system of ventilation was adopted in the latter. The sink was removed beyond the wall of the yard, and a proper system of drainage was adopted around both the main and auxiliary buildings, and the children's hospital.

After some excellent observations on the formidable nature of puerperal fever, Professor Faye enters at considerable length into the subject of its treatment. Opium, quina, and iodine are among the medicines on which, according to circumstances, he appears to place the most reliance.

The author gives an elaborate chapter on the mortality of puerperal women. It appears that, during eight years in

Christiania, there died of parturient women of the higher classes 1 in 35·3, while in the trading and operative classes the proportion was 1 in 54·6. The proportion of deaths in the Lying-in-Hospital, during twenty years, was 1 in 34, nearly 3 per cent. From 1845 to 1857, the mortality in the hospital was, among patients occupying single-bedded rooms, 1 in 81; among those occupying the common wards, 1 in 44.

We have, in the foregoing paragraphs, alluded merely to those points in Professor Faye's excellent essay which contain most special information likely to be interesting to our readers. Puerperal fever is, unfortunately, of too frequent occurrence in this country to render it necessary to follow him through the details of his observations on its diagnosis and treatment.

2. The second pamphlet on our list contains the history of a case in which, on account of narrowness of the pelvis, premature labour was induced, with mutilation of the head and trunk of the fœtus.

3. The discussions reported in the third of the above works are not of sufficient interest to the British reader to render it necessary that we should give an abstract of them in our pages.

4. Dr. Heyerdahl commences his essay, which was originally published in the Norsk Magazin in 1854, by expressing his satisfaction that, in the present state of science, embryotomy is more rarely employed than was formerly the case. At the same time he adds that, when properly indicated, it is fully justifiable as an indispensable and rational means of saving the mother's life.

The object of Dr. Heyerdahl's pamphlet is to introduce to the notice of the profession a plan, devised by the author, for separating the parts of a fœtus, by means of a sawing motion with a cord of hemp or fine metallic thread. The intention is chiefly to avoid injury to the organs of the mother. Cases are detailed to show that, by such means, the dismemberment can be rapidly effected.

5. Dr. Heyerdahl's remaining pamphlet contains a very complete and interesting history of the use of chloroform in midwifery, with practical directions for its employment.

PART III.

MEDICAL MISCELLANY.

TRANSACTIONS OF THE COUNTY AND CITY OF CORK MEDICAL AND SURGICAL SOCIETY[a].

(*Continued from* vol. xxvii., p. 490.)

SESSION 1858–59.

MAY 26, 1859.

DR. O'CONNOR, PRESIDENT, in the Chair.

Case of Labour during Typhus. By WILLIAM CUMMINS, M. D.—"The complication of any of the malignant blood diseases, such as scarlatina, typhus, &c., with the puerperal condition, is generally and truly regarded as so extremely dangerous to life as to warrant a most unfavourable prognosis in all such cases. As an exception to this general rule, I wish to place on record, in a brief communication, the following case:—Mary Sullivan, aged 35, when in the ninth month of pregnancy, had the misfortune to contract typhus fever from her child. On the fifth day a few rose-coloured spots appeared on the chest and abdomen, and the disease ran its course without unusual complication, but requiring a liberal allowance of wine, until the twelfth day, when labour commenced with a moderate sanguineous discharge from the vagina, and slight pains. About three hours after I was called to her, and found her mottled all over with dark, rose-coloured maculæ; teeth covered with sordes; tongue brown and dry; perfectly rational, and complaining of the pains. The scalp had been shaved, and she had lately had some sleep; urine in tolerable quantity; pulse 120, feeble; vagina soft, cool, and relaxed; os uteri nearly dilated, cool and natural; sanguineous discharge still continues moderately. The membranes were rup-

[a] These Reports have been furnished to us by Dr. S. Henry Hobart, Secretary to the Society.—ED.

tured, and a tumbler of punch administered in divided doses; after a few hours the labour process terminated naturally, without a single unpleasant symptom, the child being born alive, but feeble; it survived two days. The mother required abundant stimulation, and an occasional opiate, with little other treatment, and that of the most ordinary kind; no bad symptoms appeared; and in ten or fifteen days she began to convalesce, and was soon perfectly restored; there was no secretion of milk, and the lochia were scanty. I was truly surprised to find, on making my vaginal examination during labour, that the uterus and vagina were the only parts of this poor woman not affected with the calor mordax of fever; it seemed as if a special Providence was watching over the parts most exposed to danger; as if Nature, with her accustomed vigilance, would not allow the dread disease to triumph uncontrolled over the double life; and truly it was wonderful to find, that when all the energies were prostrated, the essential uterine power was found equal to its task; and that while every organ, every function of the body, was impaired during a period of twelve days, the fœtus in utero was not left unprovided, and was brought into the world in a condition capable of surviving two days, although the natural source from which it should derive nutrition, after expulsion, was dried up."

Dr. Cremen read the following Report on the Exanthemata for the year 1858:—

"1. The exanthemata which occurred in Cork and its vicinity for the year 1st December, 1857, to 30th November, 1858, from the returns made by ten dispensary physicians, as well as from numerous other sources, were, with very few exceptions, extremely mild in character, and, as regards numbers, much below the average of previous years. Scarlatina and measles did not exceed 100 cases, while of small-pox there were only 14; with the exception of one case of the latter disease in my district, small-pox presented only in the neighbourhood of Glanmire; in May there occurred five cases, June 3, July 2, and August 3.

"2. Scarlatina was mild in type, and, as a general rule, not followed by anasarca; under my own observation, several cases of severe cynanche tonsillaris presented themselves, in some of which the pharyngeal mucus was engorged; some of these arose in localities and in houses in which scarlatina had existed or was present, in which no redness of the skin showed itself, though carefully looked for. Anasarca followed in some of these, and was slow in removal.

"3. The same remarks apply to measles, in regard to number, and type as to small-pox and scarlatina; the cases were isolated and scattered throughout the year; in some of the cases the bronchial symptoms were severe; no fatal cases are reported.

"4. Cases of erysipelas and varicella were exceedingly few.

"5. The exemption from exanthemata epidemic during the year may, I think, be referred to the fact that the virulence of the

small-pox and scarlatina poison seems to have exhausted itself in the epidemic of the winter of 1855 and 1856; to the increase of vaccination; to the facility of obtaining medical relief; and to the improved condition and habits of the poorer classes."

Dr. Cummins read his Report on Ague for the same period, viz.:—

"With a view to ascertaining particulars regarding ague during the year 1858, circulars have been addressed by your Secretary to all practitioners holding public appointments in the city and county of Cork; to these, fourteen replies have been received, eight from the city and its immediate vicinity, and six from the county, the latter being for the most part from the rural districts within six or eight miles of the city. 917 cases of ague have been recorded, 625 in the city, and 258 in the county. The details are as follows:—

Fever Hospital,				73
South-eastern	City	Dispensary District,	Dr. Fowler,	214
North-western	City	,,	Dr. O'Flyn,	16
Ballygarven	County	,,	Dr. R. Fowler,	0
Blackrock	City	,,	Dr. Cummins,	105
Glanmire	County	,,	Dr. Tivey,	28
Blackpool	City	,,	Dr. H. Hobart,	26
Between Rivers	City	,,	Dr. Humphreys,	17
Carrignavar	County	,,	. . . . .	1
Blarney-lane	City	,,	Dr. Cremen,	88
Blarney	County	,,	Dr. Lee,	34
Ballincollig	County	,,	Dr. Rountree,	154
Passage	County	,,	Dr. Johnson,	41
St. Luke's	City	,,	Dr. Armstrong,	120

"From this it would appear that the South-eastern (City), St. Luke's (City), Blackrock (City), and the Ballincollig (Rural), Districts have suffered most from the disease; and in each of these, with the exception of St. Luke's, local miasmatic sources of the disease are to be found. Now, it is remarkable that almost all the cases of ague in the Blackrock District appeared in the village of Ballintemple, situate on the borders of the so-called 'Park,' and that while ague has been far less prevalent in Ballintemple during 1858 than it was the preceding year, it has increased on the St. Luke's Hill, situated on the other side of the river, but evidently indebted to the Park for the miasma which produces ague.

"The character of the disease has been much the same as last year, and it has, generally speaking, yielded rapidly to quina, but with a great tendency to relapse. Altogether the facts brought before your Committee tend to bear out the suggestion made in last year's Report, that ague may be an *epidemic* disease, and that marsh miasma may have only the same relation to it as a *disposing cause* that animal putrifying matters have to epidemic typhus."

"During the months of January, February, March, and April, 60

cases of maculated typhus occurred in my district, which is generally remarkably free from the disease. The epidemic, for so it may be called, was sudden in appearance, and equally abrupt in its departure; and it is a remarkable fact that not a single case appeared in the village of Ballintemple, where ague has been a perfect plague during the last few summers; while it was most prevalent in the Blackrock village, which has hitherto enjoyed perfect immunity from ague. What are we to infer from this fact? Are we to consider it a simple coincidence? Or, is there an antagonism between the causes of the two diseases? Further observations are necessary to decide this point, but it certainly is in favour of the latter view, that since ague appeared in Cork and its vicinity, typhus has been much below the average. The cases of typhus which I have alluded to were generally free from complication, but required a liberal supply of stimulants, and free circulation of pure air; the latter being the most important point in the treatment; next to it was constant and careful sponging of the skin; and last, though by no means least, an opiate at the right moment. Minor particulars had, of course, to be attended to, according to the symptoms of each individual case; but, on the whole, little medical treatment was necessary.

"Only three cases consented to go to the Fever Hospital; and of those who were treated in their own houses, only one died, and he had been much neglected in the commencement of his fever."

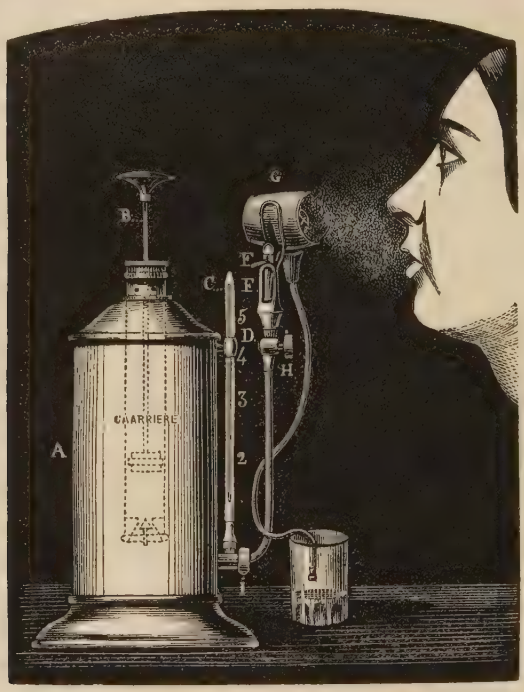
On a New System of Respiratory Therapeutics; or a Method of rendering Medicated Liquids respirable by Pulverization. By Dr. Sales-Girons.

The author proposes to render medicated liquids, such as saline or iodurettted solutions, tar-water, &c., respirable in a state of minute subdivision, or, as he terms it, of powder. The superiority of the method over the ordinary inhalation of vapour is stated to consist in this, that by means of it *fixed substances* can be conveyed in solution directly into the respiratory passages. The following is a description of the instrument, by means of which he effects this object.

Description and working of the Pulverizing Instrument.—This apparatus, represented in action in the annexed woodcut, may be defined as an instrument in which the compressed fluid finds exit by a hole in a capillary stream, which stream, meeting an obstacle at a little distance, is broken up, and reduced to the state of spray.

The whole apparatus is composed of—1, of a vessel A, containing about a quart (litre) of fluid, without being quite filled with it; 2, of an air-pump in the interior, indicated by the dotted lines; the

handle B of the piston is seen above the vessel; 3, of a gauge C, exhibiting the pressure produced on the liquid within; , of a tube



rising from the bottom of the apparatus to F, where the fluid finds exit through the capillary hole, and meets a little disc, on which it becomes reduced to a sort of thick vapour, which is observed to be directed against the nose and mouth of the patient.

To put the apparatus in action it is filled to three-fourths or four-fifths with the prescribed fluid, and the handle P of the piston being raised and lowered, as much air is accumulated on the surface of the liquid as may be necessary to make the gauge indicate a pressure of three atmospheres. The cock D is then opened, and the fluid is projected from the body of the instrument through the tube, with the pressure of these three atmospheres, equivalent to a column of water of about ninety-eight feet, and is expelled through the capillary hole with a velocity proportioned to that pressure. It will be easily seen that, as the velocity of the stream of fluid is considerable, it will, on meeting, at a distance of about an inch and a half, a small, resisting disc, be broken up, and so form the liquid dust or spray.

But this subdivision, which reduces cold water to the state of

vapour, which is also cold, must be seen to convince one that it is possible to render a liquid of a temperature below 50° F. more easily respirable than vapour.

When the pressure is diminished in consequence of the discharge of the fluid, a few strokes are given to the piston B, and the pressure of three atmospheres is maintained.—Condensed from the *Bulletin Général de Thérapeutique, Feb.* 28, 1859, p. 161.

On the Fibrous Bands of the Pericardium. By Professor H. Luschka, of Tübingen.

In directing attention to this formation, which has hitherto completely escaped observation, I must first make some remarks upon the so-called fibrous lamina of the parietal portion of the pericardium, with which it is closely connected.

In childhood I find the fascia endothoracica in the form of a very insignificant layer of areolar tissue, effecting the attachment of the pleura; in adults, on the contrary, it is everywhere very strongly developed, and especially, as Hyrtl correctly remarks, towards the vertebral column. As I have on another occasion observed, this fascia derives considerable strength from the three inferior intercostal spaces, in consequence of the accession in this situation of tendinous tissue from the oblique abdominal muscle. I shall take another opportunity of showing that auxiliary fasciculi also join its tissue from the sternum.

The portion of the fascia endothoracica lying beneath the diaphragmatic division of the pleura is easily isolated in adults, especially if the preparation has lain for some time in diluted alcohol. We can, moreover, satisfy ourselves, from the examination of any dead body, that the section of the diaphragm which is not covered by the pleura, in front of, and posterior to, the pericardium, is invested with a comparatively thick fascia. On carefully separating the diaphragmatic fascia, we find regularly here and there a transition into its tissue of tendinous fasciculi, derived from superficial muscular fibres.

The diaphragmatic section of the fascia endothoracica passes from all sides to the periphery of the pericardium. Its textural elements run for the most part arranged as flat, firm, tendinous-looking fasciculi, in a longitudinal direction *over* the outside of the pericardium, and here give rise to a membranous layer presenting split-like deficiencies. The smaller number of its constituents pass *under* the pericardium, and therefore over the centrum tendineum; but they also form a membranous stratum, which effects the connexion between the pericardium and diaphragm, being usually less firmly attached to the latter than to the former. This is corroborated by the observations of A. Portal[a], who in one case met a collection of fluid be-

[a] Cours d'Anatomie Médicale, tome iii., p. 5. Paris: 1803.

tween the pericardium and the diaphragm, and has often found a large quantity of fat in the same situation.

From these statements it would appear that the fascia endothoracica, on arriving at the diaphragmatic border of the pericardium, divides into two laminæ, one of which passes over, the other under the pericardium. In the periphery of the division a very firm attachment takes place, rendering the separation of the pericardium particularly difficult, in consequence of a number of tendinous fasciculi of the diaphragm, instead of passing into the centrum tendineum, uniting in various modes with the fibrous tissue passing over the pericardium. So soon as this intimate connexion, involving the periphery of the adherent portion of the pericardium, is overcome, the further separation of the sac can usually be accomplished, even in adults, without much difficulty.

In infancy and early childhood the pericardium can with the greatest ease be separated from the diaphragm, in consequence of the portion of the fascia endothoracica connected with it still consisting of a layer of soft areolar tissue. The latter subsequently becomes denser, and most of its elements assume a more tendinous character in proportion as age advances. It would almost appear as if the extension of its tissue, connected with the motions of the heart and diaphragm, in the course of years caused these changes in its qualities.

The tendinous tissue of the pericardium does not, when the membrane is reflected to form the visceral layer, turn into the latter, but is continued into the adventitious coat of the large vascular trunks, and particularly on the wall of the aorta. This fact is worth attention in reference to the explanation of certain pathological phenomena. Thus in a case of rupture of the ascending aorta which I examined, the pericardial sheath of the vessel was, as well as over this, the adventitious membrane of the artery, strengthened by that tendinous tissue, separated and distended prior to the irruption of the blood into the cavity of the pericardium, like a purse, as far as the origins of the arterial trunks given off from the convexity of the aorta.

Into the constitution of the fascia pericardii, structures also regularly enter, which we must designate as *fibrous bands* of the pericardium, or, so far as they take their origin from the sternum, as *ligamenta sterno-pericardiaca.*

Writers have in general stated that the pericardium and the sternum are connected only by a loose, partly adipose, areolar tissue. It is now some time since my attention was arrested by an arrangement I observed between the xiphoid cartilage and centrum tendineum[a]. This was a tendinous streak, which I provisionally termed ligamentum sterno-diaphragmaticum, because I was of opinion that it was derived from the tissue of the anterior extremity of the cen-

[a] Joh. Müller, Archiv für Anatomie und Physiologie, p. 337. 1857.

tral tendon of the diaphragm, and was inserted into the upper extremity of the posterior surface of the xiphoid process.

I have on several occasions paid attention to this subject, and not only obtained a clearer view of the nature of the part in question, but have also been led to the discovery of another analogous structure. Thus it appeared that, normally, *several* fibrous cords proceed from the posterior surface of the sternum, and are lost at the anterior part of the circumference of the pericardium in the tendinous layer of the latter. They are not always equal in number and in the degree of their development; but since I first became aware of their existence, I have never failed to find them. The points at which they pass into the pericardium are frequently plainly perceptible, so soon as the anterior thoracic wall has been removed in the usual mode. On attentive observation, a greater or less amount of roughness will be perceived on the anterior surface of the parietal pericardium, in a situation corresponding to about the middle line of the sternum, whence tendinous fasciculi radiate in a fan-shape over the sac. A clear and instructive view of the matter is, however, to be obtained only by removing the anterior thoracic wall from the right margin of the sternum (as the bands are for the most part attached a little to the left of the mesian line), separating the right anterior mediastinal wall, and carefully examining from this side, through its whole extent, the areolar tissue contained in the anterior mediastinum. The observer will soon fall upon isolated tendinous striæ, and be able to trace them through the loose areolar tissue, on one side to the membrana sterni posterior, on the other to the pericardium. I have hitherto seen such fibrous cords arise from three points.

Most constantly I found a flat, tolerably extensible ligament, of tendinous lustre, everywhere abounding in elastic fibres, arising from the posterior surface of the base of the xiphoid process. This ligament lay over the sternal portion of the diaphragm, with which it was connected by adipose areolar tissue, and proceeded in a more or less oblique direction upward, having previously separated into several bundles, to spread out in the fibrous lamina of the pericardium. The ligament is, on an average, a little under an inch in length, and is four millimetres (0·15748 inch) in breadth. We not unfrequently find that it assumes its fan-like expansion from the inferior boundary of the pericardium, presenting an appearance as if its fasciculi ran into the anterior border of the central tendon. Closer examination, however, leaves no doubt that its terminal expansion takes place not here, but upwards on the pericardium.

A second origin of a sterno-pericardial ligament I have often found, although by no means regularly, on a level with the sternal ends of the third pair of ribs. The ligament was in this situation: shorter, slighter, divided into several bundles, and was inserted into the pericardium towards the middle of its anterior periphery. A third, variously developed, fibrous stripe I have traced downwards

from the upper extremity of the xiphoid cartilage to the middle of the superior third of the pericardium; this ligament, consequently, followed a course exactly opposite to that of the inferior sterno-pericardial ligament. I had formerly repeatedly observed that tendinous striæ in the anterior mediastinum could be traced into the tissue of the fibrous lamina of the pericardium, but not to the sternum; while, on the other hand, they have distinctly proceeded from the side of a lamina of the anterior mediastinum, turned towards the mediastinal cavity, and may evidently be considered as derivatives of the fascia endothoracica.—*Henle und Pfeufer's Zeitschrift*, 1858, Bd. 4, 1 und 2 Heft., p. 102.

On Acute Yellow Atrophy of the Liver. By Dr. HEINRICH WALLMANN.

A HORSEMAN, aged 22, was treated at the Dispensary for a gangrenous sore in the right scapular region, which was stated to have occurred spontaneously. The patient complained only of the suffering caused by the sore; subsequently his skin assumed an icteric colour, shiverings came on, and he died, with pyemic symptoms.

At the post-mortem examination I found acute yellow atrophy of the liver, closing of the cystic duct, and narrowing of the ductus choledochus from cancerous cicatrices; blennorrhœa of the gall-bladder; scirrhus of the right supra-renal capsule; œdema of the glottis; gangrenous sore in the right scapular region; general dropsy. The liver was adherent to the diaphragm; its substance was soft and doughy, almost fluid, and was of a grayish-yellow colour. On chemical examination leucin, sugar, and several fats were found.

A second case of acute yellow atrophy of the liver occurred in a soldier, aged 23, otherwise in good condition, but presenting icteric discoloration of the skin. On post-mortem examination scirrhus of the stomach, medullary cancer of the abdominal lymphatic glands, ascites with anasarca, and tumour of the spleen, were found. The liver was enlarged, hard, of a yellowish-brown colour, studded with biliary infarctions. The surface of the liver was rough and thickened; the biliary passages were filled with thick pus, and the gall-bladder with inspissated, viscid, black bile. On chemical examination in the laboratory of Joseph's Akademie, were found leucin (in great quantity), taurin, tyrosin, sugar, and several as yet undetermined fatty matters.—*Virchow's Archiv*, Bd. 14, Heft 1 and 2, p. 204.